Contained Myocardial Rupture

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Image 1: Gross cross-section of the heart, showing a softened myocardium with yellowish discoloration involving the anterior wall of the left ventricle and anterior aspect of the interventricular septum. The anterior wall of the left ventricle furthermore contains a site of myocardial disruption, which grossly involves the approximate inner-half of the ventricular wall (i.e., a site of external rupture was not identified).

Myocardial rupture occurs in 1% to 2% of cases of acute myocardial infarction (AMI) (1, 2). After cardiogenic shock, myocardial rupture represents the second leading cause of in-hospital mortality in patients with AMI (3). Myocardial ruptures may be complete, incomplete, or contained, with contained ruptures representing an intermediate entity between the former two (3). Presented herein are gross and histologic photographs of a contained myocardial rupture in a patient who died following AMI.

A 52-year-old man was found deceased inside his apartment after a welfare check was initiated because he had missed consecutive shifts at work. By report, the last known time he was alive he was pale and complaining of feeling ill. He had no known medical history and had not visited a doctor in over 20 years. He was brought to the medical examiner's office for post-mortem exam.

Autopsy was significant for multivessel coronary artery disease (to include 90% luminal area narrowing of the mid-aspect of the left anterior descending artery), with myocardial infarction involving the anterior wall of the left ventricle and the anterior aspect of the interventricular septum (**Images 1 and 2**). Furthermore, contained within the site of infarct was a focus of grossly evident myocardial disruption (rupture), involving approximately only the inner half of the ventricular wall (**Image 1**). An associated site of external rupture was not identified, and the pericardial sac was correspondingly free of hemorrhage. Subsequent histologic examination showed myocyte necrosis in association with neutrophilic infiltrates (consistent with AMI; **Image 2**) and myocardial rupture through the entirety of the myocardial layer but contained by an overlying cap of epicardial fat (i.e., a contained myocardial rupture; **Image 3**). Toxicology testing was negative for drugs or alcohol. The cause of death was listed as AMI

Image 2: Photomicrograph of the myocardium from the anterior wall of the left ventricle, showing a robust neutrophilic infiltrate and myocyte necrosis.

due to atherosclerotic cardiovascular disease, and the death was certified as natural.

Various morphologic patterns of myocardial rupture have been described—a complete rupture is one in which there is direct communication between the left ventricular and pericardial sac, whereas an incomplete rupture is one in which the rupture does not extend through all the layers of the myocardium (4). An intermediate entity (commonly classified as a pseudoaneurysm) is also recognized to exist (2,4). Pseudoaneurysm has been broadly used to denote those ruptures that lack direct communication with the pericardial sac, to include incomplete rupture, but also to include complete ruptures roofed by either a hematoma or the visceral pericardium (4). As such, a more descriptive classification, as proposed by Helmy et al. (4) would be to label incomplete ruptures as those without full-thickness involvement of the myocardium, true

pseudoaneurysms as those with full-thickness myocardial involvement roofed by a hematoma, and contained myocardial ruptures as those with full-thickness myocardial involvement roofed by an intact layer of visceral pericardium (i.e., the epicardium). To the authors' best knowledge, **Image 3** represents the first published photomicrograph of a contained myocardial rupture.

It has been postulated that there is clinical relevance in distinguishing contained from complete myocardial rupture, as the epicardial roof likely confers some degree of protection against a hemopericardium (3,4). Of note, the pericardial sac in the present case was free of hemorrhage. While imaging modalities may not always be able to reliably distinguish between these two entities (3,4), contained rupture has been recently documented via magnetic resonance imaging (5).

Image 3: Composite photomicrograph of the rupture site of the anterior wall of the left ventricle, showing complete disruption of the myocardial layer but containment by the overlying epicardial fat (i.e. a contained myocardial rupture).

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