Effects of left ventricular unloading on reperfusion-related AIVR in acute myocardial infarction

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Figure 1. Panel A: Recurrent AIVR-induced V_{LV} and P_{LV} reduction is shown, as well as immediate restoration during sinus rhythm. Panel B: The V_{LV} , P_{LV} and ECG reveal the mechanism of the absence of atrial contribution to LV filling (red circles): AIVR directly decreased V_{LV} and subsequently P_{LV} , and the return of V_{LV} and subsequently P_{LV} after return of sinus rhythm.

Accelerated idioventricular rhythm (AIVR) often occurs in the setting of acute myocardial infarction, specifically after reperfusion. We studied the direct left ventricular (LV) dynamic effects of AIVR compared with sinus rhythm. Furthermore, we observed an

interesting finding of LV unloading on the occurrence of AIVR.

Reperfusion-related AIVR

A 76-year-old female (patient 1) with no previous cardiac history presented with an acute anterior ST-segment elevation myocardial infarction 4 hours after the onset of symptoms. The CKMB_{max} was 311 µg/l and maximal troponin T was 8.3 µg/l. Coronary angiography revealed a normal right and circumflex coronary artery and an occluded left anterior descending coronary artery (LAD). After successful percutaneous coronary intervention (PCI) with TIMI 3 flow, recurrent episodes of AIVR were observed. Simultaneously assessed left ventricular pressure (P_{LV}) and volume (V_{LV}) by conductance catheter during AIVR revealed instantaneous changes in LV dynamics (figure 1, panel A, B [left] and C [right]).

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Panel C (left and middle): Immediate AIVR-induced (from A to B) reduction of both P_{LV} and V_{LV} . Note the direct systolic effects induced by AIVR, whereas the diastolic function curve remained unchanged. Cardiac output decreased (4.0 to 3.4 l/min), as well as dP/dt_{max} (1164 to 942 mm Hg/s), and stroke work (4.7 to 3.3 mm Hg·l). **Right:** After placement of an IABP, AIVR immediately returned to sinus rhythm (SR) with positive effects on LV dynamics: dP/dt_{max} increased compared with SR and AIVR (974, 816 and 495 mm Hg/s, respectively), stroke volume and ejection fraction increased, and afterload decreased as indicated by a decreased end-systolic P_{LV} .

Panel D: Reperfusion-related AIVR was terminated by unloading the LV by an IABP, illustrated by the P_{LV} recording.

LV unloading

A 68-year-old male (patient 2) with no previous cardiac history presented with an acute anterior ST-segment elevation myocardial infarction 1½ hours after onset of symptoms. The CKMB_{max} was 340 µg/l and maximal troponin T was 6.2 µg/l. Coronary angiography revealed diffuse three-vessel disease including an occluded LAD. After successful PCI with TIMI 3 flow, persistent AIVR compromised LV dynamics (figure 1, panel C: middle). Therefore, an intra-aortic balloon

pump (IABP), at a 1:1 assist ratio, was inserted for cardiac support (figure 1, panel C: right). Consequently, AIVR immediately returned to sinus rhythm and vice versa (figure 1, panel D).

Our observations show immediate AIVR-related decreases in cardiac output, contractility and stroke work. LV unloading directly led to a return to sinus rhythm, presumably by a reduction in wall stress. ■