

# Left ventricular free wall rupture – a real nightmare

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## Abstract

Left ventricular free wall rupture (LVFWR) is a most rare but often lethal mechanical complication of acute myocardial infarction (AMI). The mortality rate for LVFWR is described from 75% to 90% and it is the cause for 20% of in-hospital deaths after AMI. Death results essentially from the limited time available for emergent intervention after onset of symptoms. Emergency surgery is indicated and normally the rupture site is easily identified, but it may not be apparent macroscopically, corresponding to transmural or subepicardial dissection with an external rupture far from the infarction site, or already thrombosed and contained. Repair of the ventricular wall is usually achieved either by suturing the edges of the tear or closing it with patches of artificial material or biological tissues, usually using some kind of biological glue. However, several cases of successful conservative management have been described. In this Editorial, I comment on the meta-analysis conducted by Matteucci et al, published in this issue of the Journal, including 11 non-randomized studies and enrolling a total of 363 patients, which brings a great deal of new knowledge that can help not only in the prevention but also in the management of this dreadful complication of AMI.

## Left ventricular free wall rupture – a real nightmare

**Short Title : left ventricular free wall rupture**

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ABSTRACT

Left ventricular free wall rupture (LVFWR) is a most rare but often lethal mechanical complication of acute myocardial infarction (AMI). The mortality rate for LVFWR is described from 75% to 90% and it is the cause for 20% of in-hospital deaths after AMI. Death results essentially from the limited time available for emergent intervention after onset of symptoms. Emergency surgery is indicated and normally the rupture site is easily identified, but it may not be apparent macroscopically, corresponding to transmural or subepicardial dissection with an external rupture far from the infarction site, or already thrombosed and contained. Repair of the ventricular wall is usually achieved either by suturing the edges of the tear or closing it with patches of artificial material or biological tissues, usually using some kind of biological glue. However, several cases of successful conservative management have been described. In this Editorial, I comment on the meta-analysis conducted by Matteucci et al, published in this issue of the Journal, including 11 non-randomized studies and enrolling a total of 363 patients, which brings a great deal of new knowledge that can help not only in the prevention but also in the management of this dreadful complication of AMI.

Left ventricular free wall rupture (LVFWR) is a most rare but often lethal mechanical complication following acute myocardial infarction (AMI). The incidence of LVFWR was much higher when thrombolytic therapy was used and has decreased dramatically with the advent of emergency percutaneous intervention. Currently the occurrence is around 1%<sup>1</sup>.

LVFWR is more frequent as a first transmural myocardial infarction in elderly patients, with no gender difference. Other risk factors include arterial hypertension, long episode of angina and delayed hospital assistance, persistent ST segment elevation and sudden or progressive hypotension or sudden electromechanical dissociation. Rupture usually occurs early in the evolution of the infarct, however, late rupture can occur more than 48 hours after the onset of symptoms in up to 30% of the cases.<sup>2</sup>

The mortality rate for LVFWR is said to be from 75% to 90% and it is the cause for 20% of in-hospital deaths after AMI.<sup>3</sup> Death results essentially from the limited time available for emergent intervention after onset of symptoms. The survival rate of AMI patients conservatively treated was reported to be only 10%. Timely diagnosis and an emergent treatment strategy are essential for saving patients' lives. Signs of cardiac tamponade with hemodynamic instability may occur which should lead to suspicion of the complication. The echocardiogram is essential in the diagnosis which should trigger emergency surgery. It has a level of sensitivity and specificity of over 90%. A pericardial effusion of 10 mm or more is correlated with an increased risk of free wall rupture. Some authors recommend confirmation of the epicardial fluid by needle aspiration.

Emergency surgery is indicated and normally the rupture site is easily identified, but it may not be macroscopically apparent, corresponding to transmural or subepicardial dissection with an external rupture far from the infarction site, or already thrombosed and contained.<sup>1</sup> Repair of the ventricular wall is usually achieved either by suturing the edges of the tear or closing it with large patches of synthetic materials (dacron, Teflon, etc.) or biological tissues (bovine or autologous pericardium), usually glued to the epicardium with some kind of biological glue. Lately, collagen sponge patches have been used with a good degree of success. However, several cases of successful conservative management have been described,<sup>4</sup> naturally depending of the size of the rupture and the capacity of the patient to rapidly promote thrombosis of the rupture channel.

In a manuscript published in this issue of the Journal, Matteucci et al,<sup>5</sup> from 7 different European institutions, made a comprehensive literature review to identify articles reporting outcomes of subjects who underwent surgical repair of left ventricular free-wall rupture. The primary endpoint was operative mortality. A meta-analysis was performed to assess the associations of predefined variables of interest and clinical prognosis. From 3,132 retrieved articles, the authors identified 11 non-randomized studies, enrolling a total of 363 patients that, fulfilled the inclusion criteria and were included in the analysis. They found that "surgical treatment of post-infarction (LVFWR) has a high operative mortality rate of 32% which was reduced in patients with oozing type rupture as compared to blowout type (not defined). Mortality was also significantly reduced in subjects in whom LVFWR was treated with sutureless (patch) techniques, as compared to those undergoing sutured repair, while it was increased in patients who required postoperative ECMO support. Blowout rupture, sutured repair and postoperative ECMO support are factors associated with increased

risk of operative mortality. No difference in hospital mortality was found between patients treated under cardiopulmonary bypass as compared to those in which it was not utilised. A similar finding with regard to the intraoperative use of intra-aortic balloon pump.

The authors conclude that “surgical treatment of post-infarction is one of the most lethal complications of acute myocardial infarction. The optimal therapeutic strategy is controversial and the current meta-analysis helps to evaluate the outcome of patients surgically treated for post-AMI LVFWR”.

As one of the reviewers stressed, during the editorial process, “due to the retrospective nature of the study, there are inherent limitations regarding the population. Elements such as echocardiographic parameters (LVEF, associated MR or RV dysfunction, delay between MI and symptoms onset, delay between onset of symptoms and surgery and biochemical markers are not known). Yet, limitations of the scope of the findings (less invasive surgeries and less extensive disease having better outcomes) are well identified. Regarding the use of ECMO postoperatively, indications and outcomes are not clearly described beside survival”. The authors, themselves, recognize the limitations of their analysis which are also related to some limitations and inconsistencies of some of the studies included.

However, this paper brings us a great deal of knowledge, that can help not only in the prevention but also in the management of this dreadful complication of AMI. The authors are to be congratulated on this, as they should also be on a similar study in patients with interventricular septal rupture (VSR) after AMI, another complex post-infarction complication, very recently published in another Journal.<sup>6</sup> And the current paper is a complement of a paper on the same subject (LVFWR), also recently published,<sup>7</sup> on 140 patients from the CAUTION study database who were surgically treated for post-AMI LVFWR in 15 different centres from 2001 to 2018, from which they concluded that “surgical repair of post-infarction LVFWR carries a high operative mortality. Female gender, preoperative left ventricular ejection fraction, cardiac arrest, and extracorporeal life support, are predictors of early mortality”, which differs little from the conclusions derived from the meta-analysis now made.

In another recent study, Formica et al analysed the results in 35 patients who underwent surgery for LVFWR in a 17-year period at their institution.<sup>8</sup> They concluded for “a trend towards long-term benefit in patients surviving high-risk surgery for LVFWR repair. Considering the high lethality of LVFWR, the urgency and complexity of the primary surgical intervention early diagnosis and prompt surgery play a key role in the management of this complication.”

A final comment: As indicated above, delayed admission to hospital was identified as one of the risks for LVFWR. Fear to come to hospital during the current COVID19 pandemic has been a cause for many unrelated deaths worldwide. One such case was just described.<sup>9</sup> I am quite sure that there were much more during this period.

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