The authors reported no conflicts of interest.

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supported with ECMO died from brain death" and "the results of this study did not provide any evidence to support any benefit of perioperative ECMO on in-hospital survival."

The pathophysiology of cardiac tamponade is that increased intrapericardial pressure disturbs the diastole of cardiac chambers and venous return to the right atrium. As a result, venous pressure rises significantly. Not only low cardiac output but also high venous pressure lowers the systemic perfusion pressure, which is described as arterial pressure minus venous pressure. Cerebral perfusion pressure also decreases. If ECMO is started, placing a venous cannula from the femoral vein can only drain the inferior vena cava vein. Pressure on the superior vena cava vein may be consistently high, cerebral perfusion pressure remains low, and blood flow from ECMO via the femoral artery might perfuse the lower body. ECMO might be invalid for brain resuscitation (Figure 1). In my opinion, the high priority and sole treatment for collapsed patients with cardiac tamponade is to drain the pericardial hemorrhage and lower the venous pressure rather than ECMO. There is no clinical evidence or experimental data supporting this theoretical idea. However, we believe it is better to accept the data from the paper of Formica and colleagues, which represents the ineffectiveness of ECMO in such situations.

The second point is the classification of LVFWR. LVFWR has been historically classified into blow-out and oozing types. However, we often observe that bleeding from the left ventricle ceases (seals) spontaneously after pericardial drainage (Table 1). Decreased blood pressure due to cardiac tamponade may be the cause. Okamura and Formica and colleagues classified all of their patients as blow-out or oozing types. Judging from their intraoperative images, they might have categorized sealed ruptures as oozing ruptures. We think it is better to classify LVFWR into 3 groups: blow-out ruptures, oozing ruptures, and sealed ruptures. Distinguishing sealed ruptures from oozing ruptures is crucially important to compare the operative results of different surgical techniques, such as suture repair and suture-less repair.

TABLE 1. Classification of left ventricular free wall rupture after myocardial infarction

Author	Okamura et al[1]	Formica et al[2]	(Our data)
Study period	2001-2016	2000-2016	2000-2020
Number of patients	35	35	36
Classification			
Blow out	2	16	11
Oozing	33	19	4
Sealed	0	0	21

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REPLY: I WOULD NOT UNDERESTIMATE THE EXTRACORPOREAL MEMBRANE OXYGENATION OPTION; IT OFFERS CHANCES OF SURVIVAL

Reply to the Editor:

We read with great interest the letter by Uchida and colleagues[1] regarding the efficacy of preoperative extracorporeal membrane oxygenation (ECMO) in patients suffering from left ventricular free wall rupture (LVFWR) following acute myocardial infarction. In their letter to the editor, the authors discussed some points highlighted in the study by Okamura and colleagues[2] and in our letter to the editor.[3] First, the authors have stated some concern regarding the use and efficacy of preoperative ECMO in patients with cardiac arrest, and second they proposed to classify the LVFWR into 3 groups: blow-out ruptures, oozing ruptures, and sealed rupture.

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Regarding the first point, we reported[4] the use of the preoperative ECMO support for those patients who had pericardial tamponade at presentation complicated with cardiac arrest. All these patients underwent ECMO by peripheral cannulation during cardiopulmonary resuscitation, and it was not possible to drain pericardial blood before restoring blood circulation by ECMO institution. Among these patients, brain death was a consistent cause of death, and it was not possible to verify potential weaning and the clinical efficacy of ECMO therapy. Moreover, multivariable analysis identified only cardiac arrest at presentation as an independent predictor of in-hospital mortality (odds ratio, 11.7, 95%; confidence interval, 2.352-59.063; $P = .003$). Having said that, we agree with Uchida and colleagues regarding the utility of rapidly draining the pericardial blood to improve the cardiac output and to reduce the cerebral venous pressure. However, pericardial blood drainage is feasible in those patients with cardiac tamponade syndrome who still have myocardial contractile activity despite high doses of inotropic and vasoconstrictor drugs and instead not in those patients undergoing manual or automatic external cardiac massage in whom the absolute priority is to re-establish the systemic circulation very quickly.

Uchida and colleagues have correctly highlighted our statement[4] regarding the absence of any benefit of perioperative ECMO on in-hospital survival in patients with cardiac arrest. However, it is worthy to note that 17.4% of patients supported by preoperative ECMO for cardiac arrest had a good outcome. This is the reason why we emphasized[3] the use of ECMO to offer an immediate support and stabilization in those patients who presented with cardiac arrest.

Regarding the second point discussed by Uchida and colleagues, their classification of LVFWR in 3 groups is shareable. However, the difference between the oozing and sealed rupture is not always discernible during surgery, as is the case between blow-out and sealed rupture, the latter as a clear clot apposition on the site of rupture offering a temporary seal. Hence, in terms of surgical approach, we prefer to consider the classical 2 pathologic findings of LVFWR, preferring the sutureless technique[3,4] in such cases of clear operative evidence of oozing rupture.

Unfortunately, cardiac arrest following LVFWR is a poor prognostic factor, and a prompt diagnosis together with a rapid stabilization therapy and management are crucial to reduce the in-hospital complications and mortality in patients with LVFWR following acute myocardial infarction. ECMO implant may restore the organ perfusion and might change the otherwise-bad outcome in these very compromised and sick patients.

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REPLY FROM AUTHOR: IS EXTRACORPOREAL MEMBRANE OXYGENATION USEFUL IN CARDIAC TAMPONADE?

Reply to the Editor:

I appreciate the insightful letter by Uchida and colleagues[1] regarding our group's previous articles about sutureless repair of left ventricular free wall rupture (LVFWR) and subsequent discussion with Formica and colleagues.[2,3]

Extracorporeal membrane oxygenation (ECMO) has been widely used to stabilize hemodynamics rapidly. As Uchida colleagues[1] argued, however, some patients with LVFWR who have cardiac tamponade do not survive even with ECMO. In the study by Formica and colleagues,[4] 6 of the 8 nonsurvivors with preoperative ECMO died of brain death. Although some of the brain deaths might have already occurred before ECMO, there is a concern