Which strategy should be chosen for ischemic free wall rupture on-pump or off-pump?

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Abstract

In 2017, I reported sutureless repair as a treatment for ischemic heart rupture, and found that an off-pump technique using fibrin glue sheets or other materials might contribute to excellent clinical results. In a similar case, Ishii and colleagues reported a patient who underwent sutureless repair with hemostat materials on the bleeding site without cardiopulmonary bypass. Even today, conventional repair under cardiopulmonary bypass leads to unsatisfactory results. A case of a huge pseudoaneurysm after such a repair of left ventricular wall rupture was reported. Although this kind of repair is a simple procedure for ischemic rupture of the left ventricle, clinicians should consider that it carries a potential risk of aneurysmal formation after surgery.

Keywords: Ischemic cardiac rupture, Cardiac rupture, Off-pump repair, TachoComb®, TachoSil®.

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Commentary

I reported sutureless repair as a treatment for ischemic rupture of the left ventricle in 2017 [1]. Even today, cardiac rupture after acute myocardial infarction can result in life-threatening complications. Such ruptures include left ventricular free wall rupture, ventricular septal peroration, and mitral papillary muscle rupture. These lethal complications mainly occur within 7 days after myocardial ischemia. Clinical outcomes of free wall rupture are poorly studied. As conventional procedures, suture closures of lesions with or without patches are chosen under cardiopulmonary bypass. Because of the rapid hemodynamic deterioration of patients with the rupture, the mortality rate within a week is very high when left untreated. Herein, I contribute an update review of ischemic rupture of the left ventricular free wall.

In 2017, I reviewed articles published between 1993 and 2015 on PubMed, and found that an off-pump sutureless technique using fibrin glue sheets or other materials with or without fibrin glue might contribute to excellent clinical outcomes [1]. Materials for the procedure have been revised, with TachoComb® (CSL Behring, Tokyo, Japan) and TachoSil® (Baxter Healthcare Corporation, Dearfield, IL, USA) replacing Teflon and autologous pericardium. However, some technique limitations might remain for severe blowout-type ruptures, and the possibility of an aneurysmal formation at the repair site after surgery should not be missed. I concluded that the off-pump sutureless technique represent a valid strategy for the treatment of ischemic rupture of the left ventricle although serial echocardiographic follow-up studies should be mandatory for the diagnosis of the pseudoaneurysmal formation.

Since 2016, more authors have described the sutureless technique. Ishii and colleagues reported a case, who underwent a sutureless repair with Hydrofit® (Terumo, Tokyo, Japan) and Surgicel® (Johnson & Johnson, New Brunswick, NJ, USA) composite on the bleeding site without cardiopulmonary bypass [2]. Newly developed materials for hemostat might contribute to the success of operative procedures, albeit surgeons must get to know their characteristics and how to use them correctly.

Formica and colleagues showed a retrospective study of 35 patients who underwent surgery for ischemic rupture of the left ventricle between January 2000 and December 2016 [3], a 17-year single-center experience. The mean age of their patients was 68.3 years and the in-hospital survival was 65.7%. Of note, the authors mentioned that the use of extracorporeal membrane oxygenation was associated with hospital mortality.

I also referred previously to a potential risk of a pseudoaneurysm formation after sutureless repair [1]. Diez-Villanueva and colleagues showed a case of a huge pseudoaneurysm of the left ventricle after off-pump sutureless repair [4]. Serial transthoracic echocardiograms on the 30th day after the operation revealed a large inferolateral pseudoaneurysm associated with thrombus, moderate mitral regurgitation, and severe left ventricular dysfunction. The patient successfully underwent a Dor procedure. Ventriculoplasty with patches using a circular or linear repair technique is becoming a golden standard for left ventricular aneurysms. Kaya and colleagues presented their experience of 89 patients (74 males, 15 females) who underwent post-infarction left ventricular aneurysm repair between 1996 and 2016 [5]. Ventricular reconstruction was performed using endoventricular circular patch plasty (n=48) or linear repair technique (n=41). In-hospital mortality occurred in 4.1% and 7.3% in the circular and linear repair groups, respectively. This study demonstrated that post-infarction left ventricular aneurysm repair could be performed with both techniques with

an acceptable surgical risk and satisfactory hemodynamic improvement.

Sutureless repair is an excellent and simple procedure for ischemic rupture of the left ventricle, but surgeons should keep in mind that it carries a potential risk of aneurysmal formation postoperatively. Large sheets covering the entire infarcted lesion including the non-ischemic myocardium would reduce the wall stress of the ischemic lesion. Treatment without heparinization might also contribute to successful outcomes. Careful management after the repair procedure, particularly with intra-aortic balloon pumping which lowers the afterload of the impaired ventricle, might lead to better outcomes. Serial echocardiographic studies are also mandatory for the diagnosis of complications without delay.

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