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# APICAL VENTRICULAR SEPTAL DEFECT FOR ACUTE MYOCARDIAL INFARCTION – CASE REPORT.

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**Abstract** Reperfusion strategies have achieved a significant reduction in mortality from acute myocardial infarction and its mechanical complications, reducing them to less than 1%. Among these complications is post-infarction Ventricular Septal Defect (VSD), which has a mortality that varies between 80%-87%% after 30 days. Its presentation is bimodal, in the first 48 hours or after the third to fifth day. We describe the case of an elderly patient who presented acute myocardial infarction and VSD after anterior descending artery angioplasty, who underwent surgical correction on day 15 post VSD, using an Amplatzer device in open heart surgery. The use of amplatzer-type device in post-infarction VSD can be a successful alternative in patients with high surgical risk.

**Keywords:** Heart Septal Defects Ventricular; Myocardial infarction; Medicals Urgencys;

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Myocardial Reperfusion; Mortality.

**Introduction**

Complications of acute Myocardial Infarction (MI) include electric, inflammatory, embolic, ischaemic, and mechanical complications. The strategies of reperfusion have achieved an important reduction of mortality in acute MI and its mechanical complications, reducing them to less than 1% (1-4). The mechanical complications are Ventricular Septal Defect (VSD), Ventricular Free Wall Rupture, and Papillary Muscle Rupture. The presentation time is bimodal: in the first 48 hours or after the third to fifth day (3,4). At the histopathological level, there is evidence of a lot of neutrophils in the necrotic zone, which suffered apoptosis and set free large quantity lytic enzymes that increase the destruction of the necrotic myocardium generating a thinned and necrotic septum; than to the rupture, allows left to right flow, volume overloaded the right ventricle, increased pulmonary blood flow and secondary overload to the left ventricle (5-7). Finally, the peripheral vasoconstriction result of the shock worsens the flow through the VSD, and cardiac output depressed (8).

The risk factors of Post-MI VSD are advanced age, female sex, hypertension, absence of angina before the infarction, first episode of AMI, lack of collateral circulation, and compromise of the anterior ventricular wall (3,5). Patient clinical history with AIM which evolves to VSD is characterized by holosystolic murmur of recent appearance, biventricular heart failure, right ventricular volume overload (left to right shunt), whose final result is cardiogenic shock. The diagnostic should be established by an Echocardiogram and Doppler ultrasonography (5,9,10), to discard Acute Mitral Insufficiency, define the size of the break, and characterize the right to left shunt (11). Concerning the guidelines of The European Society of Cardiology and The European Association for Cardio-Thoracic Surgery for the treatment of patients Post-Mi VSD, surgical repair is an emergency and the technique of choice (12). Non-surgical measures like the Intra-aortic Balloon Pump can stabilize the patient; intravenous diuretics and vasodilators should be used with caution in patients with hypotension (11). There is no consensus on the optimal time for surgery, surgical decisions in patients with cardiogenic shock must be taken by the surgical team. Early surgery reports mortality of 20-50% (12). Delayed surgery with firmer scar tissue allows an effective surgical repair, reducing partial dehiscences and residual shunts, but carries a higher risk of complications associated with heart failure while waiting for surgery, for this reason, circulatory support with ECMO (Extracorporeal membrane oxygenation) is an alternative for patients with severe heart failure, who do not respond quickly to aggressive medical therapy. Late elective surgery may be considered in patients who respond adequately to the management of heart failure.

The initial approach to patients with post-MI VSD should be based on medical treatment (reducing afterload) and adequate oxygenation, using diuretics, inotropic agents, and mechanical ventilation on patients as needed. And in the last instance, contemplating the use of the Intra-aortic Balloon Pump (IABP) (8). Mortality rates are close to 24% in the first twenty-four hours, 46% in one week, and between 67-82% in two months. However, highly variable mortality ranges are reported for the same pathology according to the medical, surgical, percutaneous or

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hybrid management carried out and the type of mechanical support used, IABP or percutaneous assist devices (ECMO, Impella) (8).

The purpose of this publication is to present the case of a patient with post-MI VSD who received medical management and surgical correction on the 15th day post VSD, similarly to patients with VSD managed in ECMO as a bridge to final closure (7).

**Clinical Case**

A 74-year-old patient, female, obese, no other pathological antecedents, consulted to the emergency department for breathlessness, chest pain, asthenia, and diaphoresis. On the initial electrocardiogram was documented extensive anterior myocardial infarction. Troponin I was 5180 pg/ml, (0 – 15.5 pg/ml), hematocrit of 36.3%, platelets 278000, INR 1.1, creatinine 0.92 mg/dl, and albumin 3.5 g/Dl.

Coronary angiography showed right coronary artery without lesions, left main stem and circumflex artery of normal caliber without lesions; obtuse marginal branch had medium caliber with 30% plaques in proximal segment and left anterior descending artery (LAD) with mid-segment total thrombotic occlusion (Imagen 1). It was performed percutaneous coronary intervention (PCI) on LAD, with drug-eluting stent implantation (SYNERGY 3,0X24 mm). In the post angioplasty period, the patient developed symptoms of heart failure. An echocardiogram was performed, which reported post-MI VSD. The patient was referred to our hospital for further treatment. The patient was admitted stable, in acceptable general conditions. The patient was referred to our hospital for further treatment. Patient was admitted stable, in acceptable general conditions.

The initial electrocardiogram showed septum necrosis. The transthoracic echocardiography reported hyperdynamic left ventricle with apical akinesia and VSD in the medial and apical portion of the interventricular septum. The defect was 16 mm and had irregular edges and towards the apex apparent intramyocardial dissection in addition to the presence of mitral annular calcification with mild regurgitation, mild hypomotility of the right ventricle with tricuspid regurgitation grade II/IV. Left ventricular ejection fraction (LVEF) was 65% (Image 1). The EuroSCORE II was 51% (given by advanced age, recent MI, support with dobutamine, surgery other than CABG, septum rupture, moderate pulmonary hypertension). There was not an indication for circulatory support in ECMO. The heart team decided to manage in the coronary ICU and surgery upon completion of 15 days of septal rupture. This time in the coronary ICU is related to survival rates in patients operated on days after ventricular rupture.

On the 15th-day post septal rupture, the patient was taken to the operation room for VSD correction. Extracorporeal circulation was installed and systemic hypothermia to 34◦C without aortic clamping, it was performed left ventriculotomy evidencing multi fenestrated type of VSD which was unified and reached a diameter of 15mm, through which was implanted a septal occluder (Amplatzer) of 22 mm diameter. Subsequently, the surgeon closed ventriculotomy. The intraoperative transesophageal echocardiogram documented normal-implanted device without shunts, LVEF 45%, adequate size of right cavities and left atrium, and presence of mild mitral and tricuspid insufficiency (Image 2).

In the immediate postoperative period, the patient required invasive mechanical ventilation

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during the first eight hours, inotropic support with norepinephrine and milrinone in a continuous way allowing progressive weaning up to 72 hours after surgery. She remained in the ICU for seven days after surgical correction and had adequate evolution with the established medical management, which was observed with echocardiogram imaging control in the 4th-day post-operatory with the presence of the Amplatzer device properly implemented, suitable size of the left ventricle, LVEF 40-50%, and mild mitral insufficiency (Image 3).

On the 8th postoperative day, the patient was discharged from the hospital in acceptable general conditions with indications for cardiovascular rehabilitation and medical treatment. She attended to the post-surgical control with functional class improvement.

**Discussion**

The mechanical complications associated with acute MI are infrequent. In Post-MI VSD before thrombolysis use, its incidence was approximately 1-3% (1,5,9,10,12,13). Nowadays, its incidence decreased to 0.17%-0.31% (1,5,10).

Medical management demonstrates a higher mortality than 90% (1,10). Emergency repair shows a decrease in mortality in these patients. The use of life-supporting devices like IABP, ECMO and others optimize the results in the management of the cardiogenic shock (5).

Emergency surgical treatment is a class I recommendation according to the guidelines of the AHA (13,14). Surgical mortality in the first 48 hours associated with ventricular dysfunction is higher than 87%.

However, patients with cardiogenic shock managed with hemodynamic support in ECMO 15 days before the surgical closure could have better survival and favorable long-term results (7). In other reference centers, there are reports of percutaneous closure with Liftech and Amplatzer devices with a success of 71.4% (10). These types of devices allow safe management with fewer major cardiovascular events, less deterioration in ventricular function, and an adequate seal of the defect (9). Primary percutaneous closure is not feasible, when the septal defect is multi fenestrated, as in the case described. Our patient presented signs of right ventricular volume overload and evolved with a positive response to inotropic and anti-heart failure therapy. It allowed us to wait the time needed to perform the surgical closure 15 days after septum rupture, the time in which is estimated that the septal necrosis has already been delimited (2). We conducted a hybrid technique in which an endovascular device is surgically implanted to decrease surgical trauma as the time in extracorporeal circulation. This is an off-label use of the device which allows an alternative to a patient with remarkably high surgical risk, which cannot be safely implanted by the endovascular way because of the anatomical characteristics of the defect (multi-fenestrated, necrotic edges that had to be dried out).

**Conclusion**

Post-MI VSD of anterior location is characterized by being multi-fenestrated which hamper percutaneous management. The Amplatzer device open-heart implantation allows the targeting of these multiple defects and to perform a quick and safe closure in patients with high surgical risk.

**Conflict-of-interest statement**

Authors declare no conflict of interests for this article.

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**Ethical responsibility**

According to resolution number 008430 of 1993 of the Colombian Ministry of Health, specifically taking into account what is stipulated in chapter 1 of article 11, the present project is considered a minimum risk research, likewise this project is outside the principles set forth in the Helsinki declaration of 1964, the present project was endorsed by the scientific technical committee of the Fundación Cardiovascular de Colombia, likewise the authors declare not to have any type of conflict of interest.

**Acknowledgments**

To all the people who participated in the case report

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**ANNEXES**

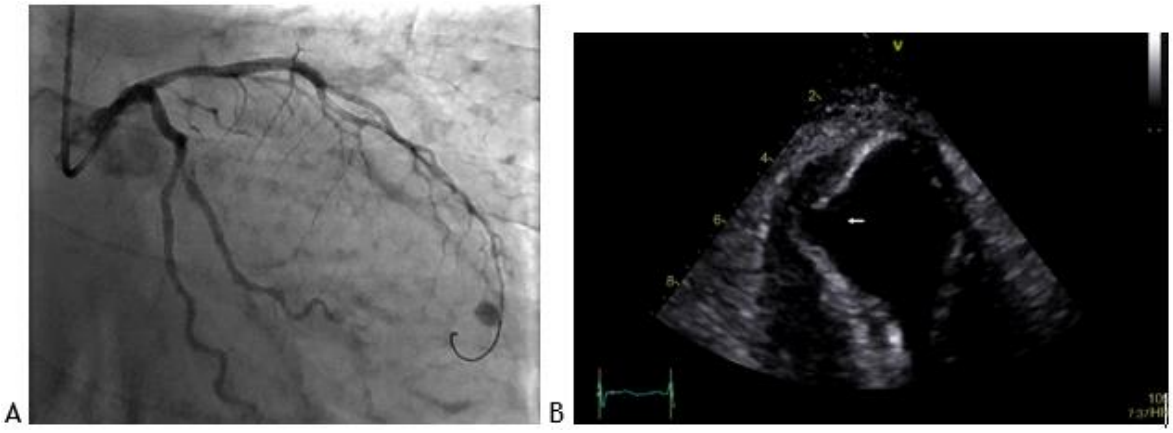


**Figure 1.** A) Coronary angiography after insertion of the intracoronary prosthesis (drug-eluting stents) and B) Transthoracic echocardiography performed one day after the beginning of the clinical history. 16 mm post-infarction interventricular defect with irregular edges.

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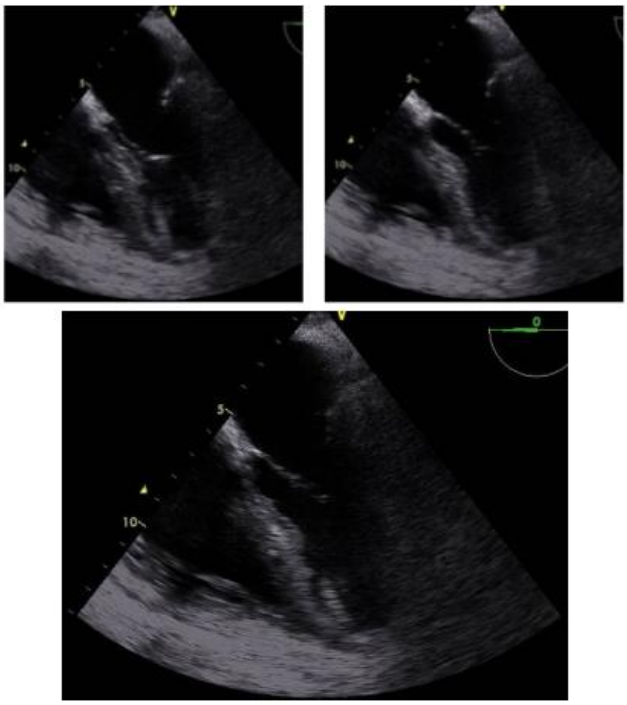

**Figure 2.** Intraoperatory Transesophageal Echocardiogram

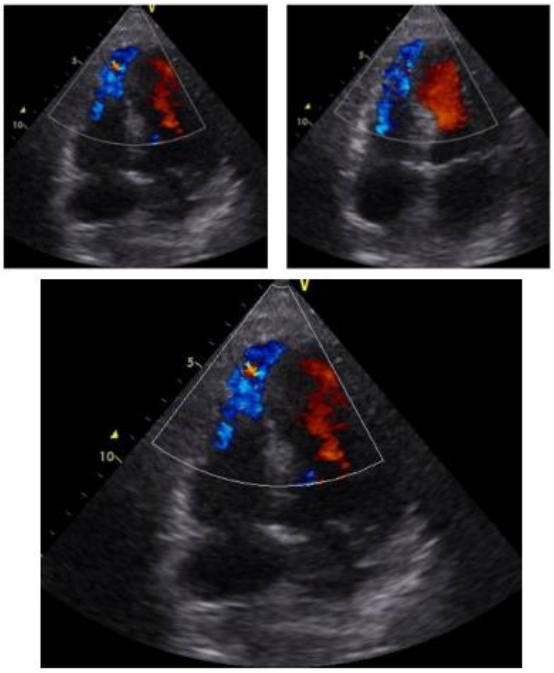

**Figure 3.** Echocardiogram performed in the ICU in the 4th day post operatory. Amplatzer device properly implemented, suitable size of the left ventricle, LVEF 40-50%, and mild mitral insufficiency.