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Case report

Left ventricular free-wall rupture, a potentially lethal mechanical complication of coronaric angioplasty: an unusual case report

Ludovica Marangoni[1], Walter Serra[1], Bruno Borrello[2], Antonella Vezzani[2], Andrea Ramelli[2], Maria Alberta Cattabiani[1]

[1] Cardiac-Thoracic-Vascular Department, Cardiology Unit, Azienda Ospedaliero-Universitaria, Parma, Italy; [2] Cardiac-Thoracic-Vascular Department, Surgery Institute, Azienda Ospedaliero-Universitaria, Parma, Italy

Summary. The incidence of complications of coronary perforation varied significantly among studies probably due to population heterogeneity and interventional techniques applied in each centre. Free wall rupture, cardiac tamponade and miocardial infarction are the most feared. The treatment of perforation remains a challenge of every cath- lab team. The management strategies range from observation to urgent operation depending on patient's hemodynamic status, severity and location of the perforation, coronary anatomy, interventional practice and equipment in each centre and operators' skills on-site. In this case an extracorporeal circulation and cardioplegic arrest with anterograde hot blood cardioplegia was done. A composite Dacron with autologous pericardium patch was used for left ventricular free wall rupture repair and the geometry of the left ventricle was restored. Subsequently aorta was declamped; the patient was weaned from CEC and a good spontaneous hemodynamic was recovered.

Key words: ENT visit, Recurrent respiratory infections, familiar atopy, tonsil, adenoid, otitis, children

ECO-TT: Trans Thoracic Echocardiogram
ECG: Electrocardiogram
ATM: atmospheres
NSTE-ACS: Non-ST-Segment Elevation Acute Coronary Syndromes
CATH-LAB: catheterization laboratory
ACLS: advanced cardiovascular life support
ROSC: return of spontaneous circulation
CEC: Extracorporeal circulation
RMN: nuclear magnetic resonance
OCT: computerized optical tomography
ANGIO-CT: angiography computer tomography
PCI: percutaneous coronarary intervention

Introduction

Coronary perforation during percutaneous intervention happens because of accidental migration of the wire deep into the coronary microvasculature. Haemostasis often requires multiple treatment modalities (prolonged balloon inflation, implantation of standard covered stent, coil embolization and/or surgical repair),the choice depends on hemodynamic status, coronary anatomy (size vessel) and centre's expertise. Ventricular wall rupture and cardiac tamponade are rare.

Case presentation

A sixty-one year old man, came to our emergency department because of a long episode of chest pain. He had a story of hypertension, hyperlipidaemia under statin therapy, type II diabetes mellitus treated with oral hypoglycaemic therapy, and he was a smoker in the past. He referred previous saphenectomy and haemorrhoidectomy operations, no other comorbidities.

He reported, for several days, the appearance of episodes of chest pain in the back that occur at rest for about five to ten minutes each

The first ECG showed sinus rhythm with ST segment depression in leads V2-V6, not evident at the repeated ECGs done in the absence of chest pain.

Repeated cardiac enzymes (CK-MB fraction and Troponin I) were slightly elevated with a typical trend (peak values CK-MB 23,7 ng/dl; Troponin I 4,83 ng/dl).

Echocardiographic (ECO) evaluation showed good right and left ventricular global function with ipo-akinesia of postero-lateral medium-basal wall. Non valvular diseases.

After the diagnosis of acute coronary syndromes (NSTE-ACS) non-ST-Segment Elevation the patient was admitted to hospital for the evaluation of suspected coronary artery disease and began a pharmacological anti-ischemic therapy complete with Ticagrelor 180 mg loading dose e, second ischemic and bleeding risks, fondaparinux (2.5 mg sc per day).

Twenty hours from hospital admission, the patient was referred to the haemodynamic laboratory and a coronarography was performed via right radial artery approach. Angiography revealed small left anterior descending with diffused luminal irregularities, not significant stenosis, intermediate artery of small calibre, with 99% proximal stenosis; normal Circumflex artery; right coronary artery, dominant, without stenosis.

In view of this and in agreement with the patient, it was decided to attempt interventional revascularization and stenting of the intermediate artery. An Ipercoat run-through guide wire was chosen for revascularization.

Pre-dilatation with Maverick 2 x 20 mm (8 ATM) balloon was done and the artery was stented with Supraflex 2 x 16 mm (14 ATM).

Finally post-dilation with Hiryu 2,25 x 10 mm balloon was done.

Angiography after wire retraction demonstrated a small depot of contrast evolving around the stented vessel segment, referred to coronary perforation of distal tract of third branch of intermediate artery.

The operator decided to achieve the haemostasis by sealing the coronary artery perforation with repeated balloon inflations lasting 5 minutes for each one.

Figure 1. Small depot of contrast around the stented vessel segment

Administration of protamine for heparin neutralization, was prescribed. A later angiographic control displayed disappearance of images related to perforation, TIMI 3 flow.

ECG did n't shows new ischemic changes

An echocardiography exam showed slight, stable, pericardial effusion.

Due to stable haemodynamic condition the patient was transferred to the coronary care unit, but the following hours the patient had a sudden haemodynamic evolution with a drop of blood pressure and increase of heart rate. An echocardiography exam revealed a severe pericardial effusion with compression of the right ventricle.

This situation was initially managed with rapid volume supply and vasopressor to maintain sufficient end-diastolic right atrial and ventricular pressure.

During the pericardiocentesis, sudden cardiac arrest occurred due to asystole, which required cardiopulmonary resuscitation. The ACLS protocol was performed for 15 minutes, with the administration of Epinephrine 3 mg which involved ROSC.

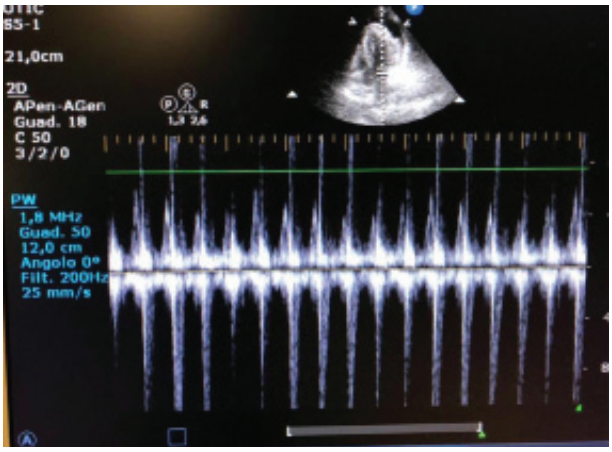

Figure 2. ECO-TT showing respiratory variation at the mitral valve consistent with tamponade physiology

Pericardiocentesis, by a subxyphoid approach, was then performed emergently at patient's bed and 500 ml of blood was removed from the pericardial space. Echocardiography was repeated 10 minutes later, having found a new pericardial effusion despite pericardial drainage. Due to persistent haemorrhage and progressive hemodynamic collapse an urgent surgery management was required .The pericardium was opened via median sternotomy and a significant amount of clot and blood was removed (about 1,5 L) with immediate hemodynamic benefit. Exploration showed an intramural ventricular haematoma of the inferior-lateral wall (site of coronary perforation) of the left ventricle with parietal haemorrhagic infarction.

Extracorporeal circulation (CEC) and cardioplegic arrest with ante-grade hot blood cardioplegia was done.

A composite Dacron with autologous pericardium patch (Resorcinol-Formol type glue) was used for left ventricular free wall rupture repair and the geometry of the left ventricle was restored. Subsequently aorta was declamped; the patient was weaned from CEC with a good haemodynamic recovery.

The postoperative evolution was characterized by bilateral decline of visual acuity. Angio-CT cerebri was negative for alteration of intracranial vessels. Retinal fluoroangiography and computerized optical tomography (OCT) were also negative for retinal ischemia and other alterations. Encephalic RMN didn't detect significant changes. In the following days the patient showed progressive improvement and slow recovery of visual capacity. No complex arrhythmic events have been recorded and good ventricular global function was maintained. The patient was then discharged after twenty days of hospitalization and started cardiovascular rehabilitation.

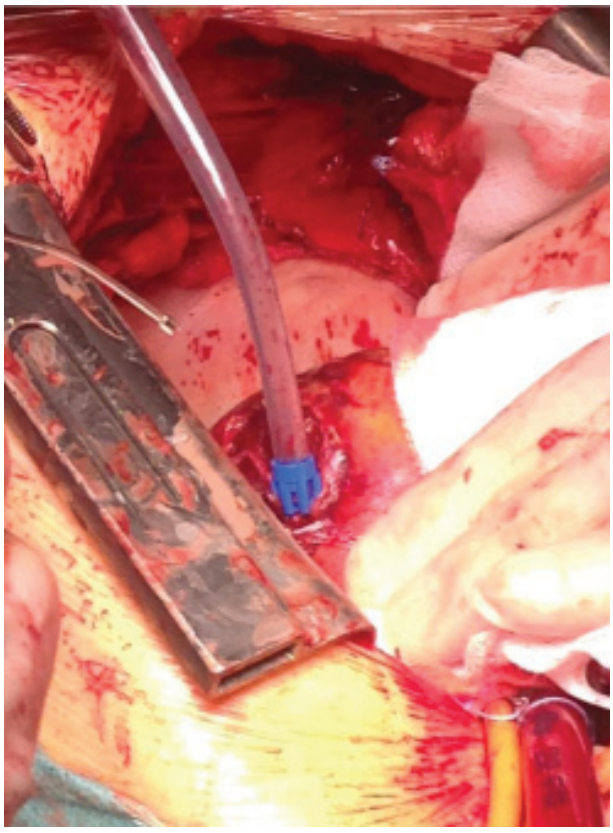

Figure 3. Intramural ventricular haematoma of the inferior-lateral wall of the left ventricle with parietal haemorrhagic infarction

Discussion

Coronary perforation during percutaneous intervention is an infrequent complication (1). In literature, short studies and sporadic case reports are reported. (2-6). In a systematic review and meta-analysis of sixteen studies, involving about 197000 PCI the pooled incidence of coronary artery perforation was 0.43%. (95% confidence interval) (4).

The most reproducible risk factors were treatment of complex lesion and use of atheroablative devices

(Rotablators) (4). Further Angiographic risk factors were treatment of complex lesion as type B or C lesions, chronic total occluded arteries, calcified lesions, tortuous and angulated vessels, small vessels as in this case (4, 5). Advanced age, hypertension, previous coronary artery bypass grafting operation, history of congestive heart failure, prior use of clopidogrel and lower creatinine clearance were described as other patient-related risk factors (4, 5). The reported incidence of complications of coronary perforation varied significantly among studies probably due to population heterogeneity and interventional techniques applied in each centre.

Free wall rupture, cardiac tamponade and myocardial infarction are the most feared complications. Perforation treatment of remains a challenge of every cath- lab team. The management strategies range from observation to urgent operation depending on patient's hemodynamic status, severity and location of the perforation, coronary anatomy, interventional practice and equipment in each centre and operators' skills on-site (1, 4, 5).

Various management strategies could be considered as reversion of heparine anticoagulation with protamine-sulfate, prolonged balloon dilatation that blocks the blood flow distal to the inflation site, covered stents that prevent blood leakage between stent struts but are frequently not suitable for end artery distal perforation, coil (1, 4, 5). Percoutaneous intervention should be the first line procedure but may be not appropriate in case of left ventricular perforation or rapidly increasing pericardial effusion. Pericardiocentesis is often required for hemodynamically unstable patients. Hemodynamic instability and emerging tamponade are the decisive criteria and should always alert clinic. (6) Continuous assessment starting from catheterization laboratory and then to the intensive care unit is extremely important as clinical deterioration can occur rapidly

Conclusion

We reported the observation of a rare complication of PCI. In an era of increase of procedural success and reduction in mortality and morbility in cath-lab most of interventional cardiologists have never been exposed personally to this uncommon complication. Every-one who works in an interventional context should fear this complication and the operator must carefully evaluate the risk and the benefit of the procedure.

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Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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Correspondence:
Walter Serra MD, PhD
Cardiac-Thoracic-Vascular Department, Cardiology Unit
Azienda Ospedaliero-Universitaria
Via Gramsci, 14 - 43126 Parma, Italy
Tel. +39 0521702070
Fax +39 0521702189
E-mail: wserra@libero.it