Primary Angioplasty Successfully Assisted by the Automated Cardiopulmonary Compression System LUCAS®

Alberto Cordero*, Pilar Carrillo, Araceli Frutos, and Ramón López-Palop

Department of Cardiology, Interventional Cardiology Unit, Hospital Universitario de San Juan, Spain

Abstract

Primary angioplasty is the first-choice for acute myocardial infarction revascularization although emergent procedures can be challenged by patients’ clinical presentation, such as cardiac arrest. We present the case of a primary angioplasty, assisted by the automated cardiopulmonary compression systems (ACCS) LUCAS®, in a patient with ST-elevation acute myocardial infarction that evolved rapidly to in-hospital cardiac arrest. The patient was transported to the cath-lab with the ACCS LUCAS® after initiation of advanced cardiopulmonary resuscitation. Primary angioplasty was successfully performed with the ACCS and it could be removed. Subsequent clinical and neurological outcomes were favorable and the patient was discharged after 14 days in permanent hemodialysis. Six months later the patient was alive with no neurological deficits but still in permanent hemodialysis.

LEARNING OBJECTIVE

Primary angioplasty is the first-choice for acute myocardial infarction revascularization although emergent procedures can be challenged by patients’ clinical presentation. This case reports a primary angioplasty successfully assisted by an automated cardiopulmonary compression system (LUCAS®) and shows the usefulness of this device in the challenging clinical setting of cardiac arrest and primary angioplasty. Clinical outcomes were fairly positive and the patient was discharged with no neurological impairments.

INTRODUCTION

Primary angioplasty is the first-choice for acute myocardial infarction revascularization although some clinical settings might delay it in order to assure hemodynamic stability, specially after excluding mechanical complications [1]. Emergent procedures can be challenged by patients’ clinical presentation, such as cardiac arrest, electrical storms or refractory shock that demand a large amount of pharmacological and personal resources. Cardiac arrest deserves fast and effective measures for resuscitation that include chest compressions [2] and the automated cardiopulmonary compression systems (ACCS) have been developed to perform it [3]. This case reports the challenging clinical setting of an acute myocardial infarction that evolved rapidly to in-hospital cardiac arrest and was successfully managed by an ACCS after and during the primary angioplasty.

CASE PRESENTATION

We present case of primary angioplasty, assisted by the ACCS LUCAS®, in a patient with ST-elevation acute myocardial infarction. A 77 years old male with antecedents of diabetes, treated with metformin, and hypertension went to the emergency department referring chest pain and discomfort that had began 90 minutes before. Blood pressure was 140/90 mmHg and heart 89 bpm. He was transferred to urgent attention box and the electrocardiogram showed 9 mm ST elevation in inferior leads. With the diagnosis of acute myocardial infarction the interventional cardiology unit was contacted. Ten minutes after the first medical contact a ventricular fibrillation was registered and successfully reverted with external 360 J shock; after the first shock, three more were needed to revert subsequent episodes of ventricular fibrillation. After that moment only sinus bradycardia (45 bpm) was registered without palpable pulse. Advanced cardiopulmonary resuscitation, with orotracheal intubation, adrenalin and atropine, was started. Ten minutes later peripheral pulse was patent and blood pressure was 80/50 mmHg, but only when external thorax compression were performed. An emergent echocardiogram was performed and mechanical complications were excluded. We decided to implant of the ACCS LUCAS® and transfer the patient to the cath-lab.

Angiography was performed by right femoral approach but angiography was hard to get due to the location of the ACCS (Figure 1A). First recordings of invasive blood pressure, with the
Figure 1 External position of the automated cardiopulmonary compression system (A) and images of the procedure that show the total occlusion of the right coronary artery (B), macroscopic thrombus obtained by manual thrombectomy (C), recovery of the distal flow after thrombus aspiration (D) and final result (E); the compression system is marked with (*).

Figure 2 Electrocardiogram and invasive blood pressure recordings with automated cardiopulmonary compression system before the angioplasty (A), successful defibrillation (B) and the moment when the automated cardiopulmonary compression system was stopped (C).
ACCS activated, were 40/20 mmHg (Figure 2A). Left coronary artery had no lesions and a total occlusion of the right coronary artery was observed (Figure 1B), that was crossed with a wire; macroscopic thrombus was obtained by an aspiration-catheter (Figure 1C), what recovered the distal flow (Figure 1D). Several shocks were needed to revert recurrent episodes of ventricular fibrillation (Figure 2B). We deployed a direct bare metal stent with successful final angiographic result (Figure 1E). We then stopped the ACCS and blood pressure was >110/80 mmHg (Figure 2C); an intra-aortic balloon counter pulsation was implanted and dobutamine infusion and the hypothermia protocol were initiated.

In the following 72 hours the hemodynamic evolution was favorable and all hemodynamic and respiratory support was progressively stopped. No ventricular arrhythmias were registered. Hemofiltration was needed due to oliguria that turned into anuria since the fifth day. Between 7 and 10 complete neurologic recovery was objectivized and the patient was transferred to the Cardiology unit in the hospital were permanent hemodialysis was concertated to start. The patient was discharged 14 days after the hospital admission with no neurological impairments. He as contacted by telephone 6 months later and he reported to be fully recovered, with no neurological impairments, although he remained in the hemodialysis program.

**DISCUSSION**

The decision of performing emergent cardiac catheterization in resuscitated patients with sudden cardiac death remains controversial [4] but in this case indication of urgent catheterization was based on the fact that it was an in-hospital cardiac arrest clearly related to a short-time lapse myocardial infarction. Emergent revascularization in the setting of in-hospital cardiac arrest or refractory arrhythmias has not demonstrated relevant clinical benefits [4] although it is one of the few remaining therapeutic strategies. Clinical and hemodynamic instability were clearly promptly by recurrent episodes of ventricular fibrillation and bradycardia in the setting of an acute myocardial infarction and, therefore, emergent percutaneous revascularization was assumed as the only possible treatment.

Cardiopulmonary resuscitation of in-hospital cardiac arrest is quite frequent and still a major problem because even when performed by well-trained hospital staff, survival rates remain unsatisfactory low, even compared to out-of-hospital cardiac arrests [5]. It has been suggested that such low outcomes are due to inconsistencies of cardiopulmonary resuscitation maneuvers, which are not usually appropriate. The ACCS have been widely described as an efficient device for cardiac arrest resuscitation [3, 6] but, also, as useful resources in complex cardiac catheterization procedures [7,8]. The LUCAS® ACCS was specifically tested in the LINC (LUCAS in Cardiac Arrest) trial [9] and showed no benefit compared to manual compressions in terms of mortality although this study was conducted only in out-of-hospital cardiac arrest patients; nonetheless, most survivors had good neurological outcomes what represents a very positive aspect.

Our report shows that the ACCS can be helpful in the setting of emergent angiography knowing that personal resources are limited and that it can; also, reduce radiation exposure of the stuff responsible of chest compressions. After primary angioplasty was successfully performed hemodynamic response was patent and the ACCS could be replaced. The ACCS have proven to provide efficient peripheral tissue perfusion [5] and combined with other resources, such as hypothermia [5,10], can be effective in selected patients with cardiac arrest, as shown in our report. We don’t believe that the ACCS should be attempted as a bridge to urgent angiographies in patients with out-side hospital cardiac arrest without a high suspect of myocardial infarction or unknown duration, because neurological impairment can be the main survival determinant [3], but it can be useful in challenging situations as our case report.

**REFERENCES**


Cite this article