

CASE REPORT

Acute Post Cardiac Injury Syndrome Occurring Immediately After a Demanding Percutaneous Coronary Intervention

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LIST OF ABBREVIATIONS:

AMI: Acute myocardial infarction
BMW: Balance Middleweight
CAD: Coronary artery disease
CANG: Coronary angiography
CPK: Creatine phosphokinase
CRP: C-reactive protein
DES: Drug-eluting stent
EBU: Extra Back Up
ESR: Erythrocyte sedimentation rate
JR: Judkins Right
LAD: Left anterior descending
LCx: Left circumflex
LVEF: Left ventricle ejection fraction
OM: Obtuse marginal
PCI: Percutaneous cardiac intervention
PCIS: Postcardiac injury syndrome
PPS: Post-pericardiotomy syndrome
RCA: Right coronary artery
STEMI: ST-elevation myocardial infarction
WBC: White blood cells

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ABSTRACT

Postcardiac injury syndrome occurs as a complication of myocardial infarction (Dressler's syndrome), of cardiac surgery (post-pericardiotomy syndrome), or post-traumatic (either iatrogenic or non-iatrogenic) and involves a pericardial or myocardial injury. There is scarce data regarding occurrence and pathogenesis of postcardiac injury syndrome after invasive procedures. Herein, we describe a rare case of acute postcardiac injury syndrome with typical clinical, laboratory, echocardiographic findings that occurred one hour after a demanding multi-stenting percutaneous coronary intervention. Possible pathogenetic mechanisms and treatment options are being discussed.

INTRODUCTION

Postcardiac injury syndrome (PCIS) occurs as a complication of myocardial infarction (Dressler's syndrome), of cardiac surgery [post-pericardiotomy syndrome (PPS)], or post-traumatic (iatrogenic or non-iatrogenic) and involves a pericardial or myocardial injury.¹ PCIS is characterized by inflammation of the pericardium, pleura, and pulmonary parenchyma following a cardiac injury; the typical patient presents with chest pain that is usually pleuritic in nature, fever, irritability, pericardial friction rub, and pericardial effusion with or without pleural effusion.¹ PCIS following percutaneous cardiac intervention (PCI) is not frequently encountered with an incidence of less than 0.5%.¹ Herein, we describe a rare case of acute PCIS with typical clinical, laboratory, echocardiographic findings that occurred one hour after a demanding multi-stenting PCI. Possible pathogenetic mechanisms and therapeutic dilemmas are being discussed.

CASE REPORT

A 51-year-old ex-smoker, male patient, with medical history of dyslipidemia and prior inferior ST-elevation myocardial infarction (STEMI), but with no critical coronary

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artery stenosis on previous coronary angiography (CANG), was transferred to our hospital for immediate reperfusion due to acute posterior-inferior STEMI, after medication discontinuation. The ECG at the emergency room showed ST-segment elevation in the inferior leads (II, III, aVF), ST-segment depression in the lateral leads (I, aVL, V5, V6), ST-segment depression in the septal and anterior precordial leads (V1-4), an R/S wave ratio >1 in lead V1, and ST-segment elevation in the posterior leads (V7-9). The laboratory assessment revealed evidence of myocardial injury, with a high-sensitive Troponin-I count of 1,125 pg/ml (normal range 0.0-34.2) and creatine phosphokinase (CPK) 562 IU/l (normal range 39-308), while white blood cell (WBC) count and C-reactive protein (CRP) levels were normal. The initial echocardiographic evaluation showed inferior wall hypokinesia with mild reduced left

ventricle systolic function [left ventricular ejection fraction (LVEF): 50%], mild mitral regurgitation and mild tricuspid regurgitation. The patient entered the catheterization laboratory hemodynamically unstable (BP=85/55 mmHg, HR= 90 beats/min), under inotropic IV infusion, and the subsequent CANG via the transradial approach revealed severe three-vessel coronary artery disease (CAD). More specifically, CANG showed a normal left main (LM), a total occlusion with a thrombus in the middle segment of the right coronary artery (RCA), mid-left anterior descending (LAD) 99% stenosis, proximal left circumflex (LCx) 70% stenosis, first obtuse marginal (OM1) 99% stenosis and second obtuse marginal (OM2) 80% stenosis. Primary PCI of RCA was immediately performed (Fig. 1a-d). The RCA was cannulated with a Judkins Right (JR) 4 6F guiding catheter. The lesion was crossed

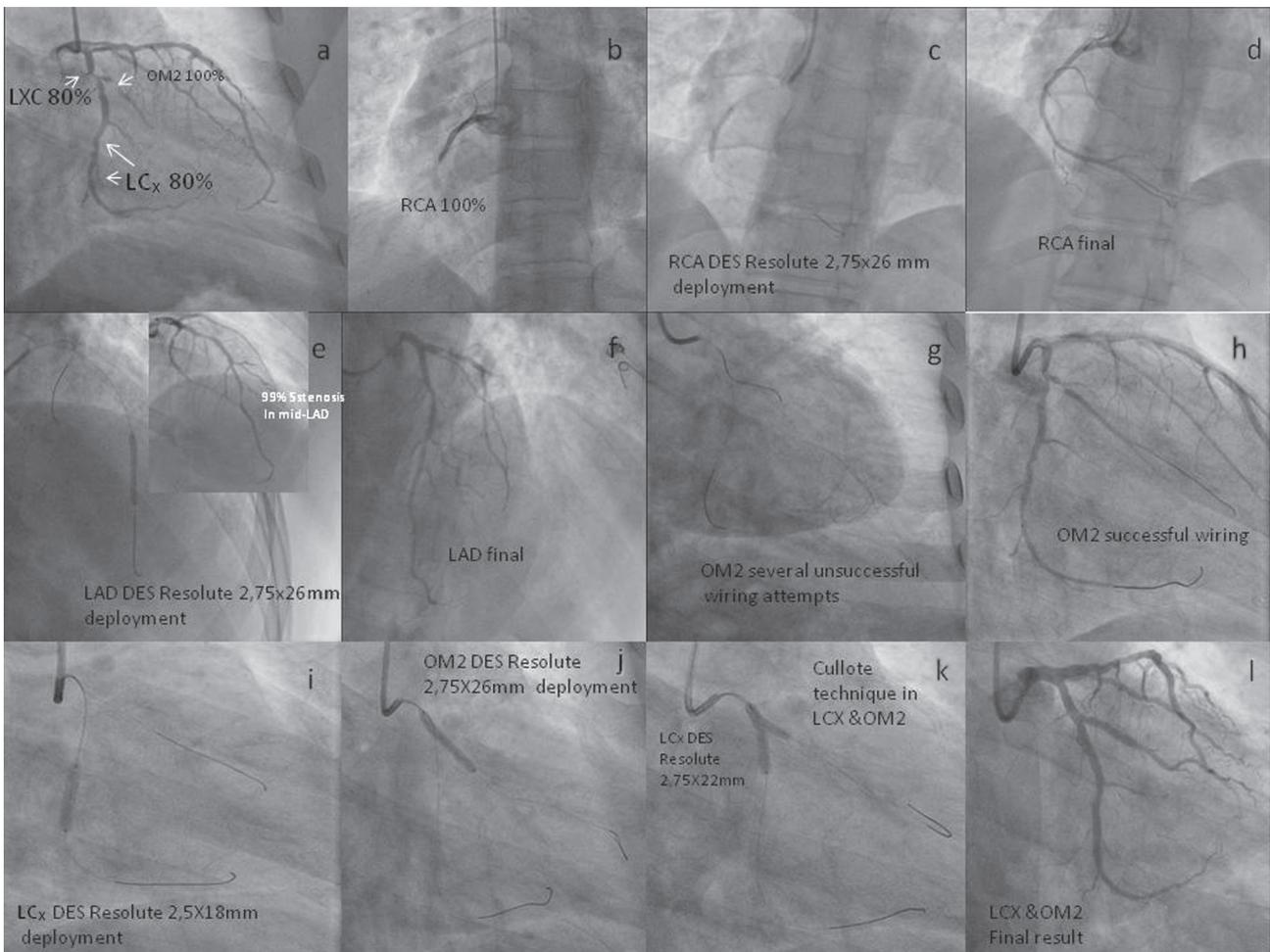


FIGURE 1. a. RAO CAU view showing severe lesions in LCx and 2nd OM (arrows). b. CRA view showing a 99% stenosis in mid-RCA. c. RCA Stent deployment and d. Final RCA primary PCI result. e. and f. LAD stent deployment and final result. g. Guidewire in LCx and unsuccessful attempts to place a wire distally in 2nd OM. h. Guidewire successfully crossed the lesion in 2nd OM. i. Stent deployment in distal LCx. j. Stent in 2nd OM with protrusion in proximal LCx. k. Stent with Cullote Technique in between prox-LCx and 2nd OM. l. Final LCx and 2nd OM stenting result.

A RARE CASE OF POST CARDIAC INJURY SYNDROME

with a Balance Middleweight (BMW) wire (Abbott Vascular, Santa Clara, California, USA) 0.014" and pre-dilatation was carried out with a 2.0×15 mm semi-compliant balloon Euphora (Medtronic, Dublin, Ireland) at 10 atm. This was followed by a successful deployment of a 2.75×22 mm drug-eluting stent (DES) Resolute Integrity (Medtronic, Dublin, Ireland) at 14 atm. Post-dilatation with a non-compliant balloon at 20 atm yielded an excellent final angiographic result. The severe lesion in the LAD was also stented (Fig. 1e,f). The LAD was engaged with an Extra Back-Up catheter (EBU) 3.5 6F, the lesion was crossed with a BMW wire 0.014" and a DES Resolute Integrity 2.75×26 mm at 12 atm was successfully implanted. A staged procedure, due to the chronic total occlusion of the OM2 was decided, and three days later, a demanding, multi-stenting angioplasty was performed in the LCx and the OM2 (Fig. 1g-l). Catheterization was performed via the right radial artery using an EBU 3.5 6F guide catheter. The procedure started by

entering a BMW 0.014" wire to the distal part of LCx. Subsequently, one DES Resolute Integrity 2.5×18mm was implanted distally in LCx (Fig. 1i) The attempt to enter a wire to OM2 was demanding and a variety of wires with different support and stiffness were used, such as BMW and Intuition (Abbott Vascular, Santa Clara, California, USA). A BMW 0.014" wire entered finally the OM2. By using the Culotte technique, one DES Resolute Integrity 2.75×22mm in the proximal LCx and one DES Resolute Integrity 2.75×26mm in the OM2 were deployed with an excellent final angiographic result. In total, two DESs containing zotarolimus were implanted in the first procedure and three more in the second one.

Almost an hour after the second procedure, the patient developed severe chest pain that was pleuritic in nature, tachypnea (26 breaths/min), and a BP=90/60 mmHg with core temperature level of 37.7°C. The ECG showed wide-spread concave ST segment elevations (Fig. 2a,b). Physical

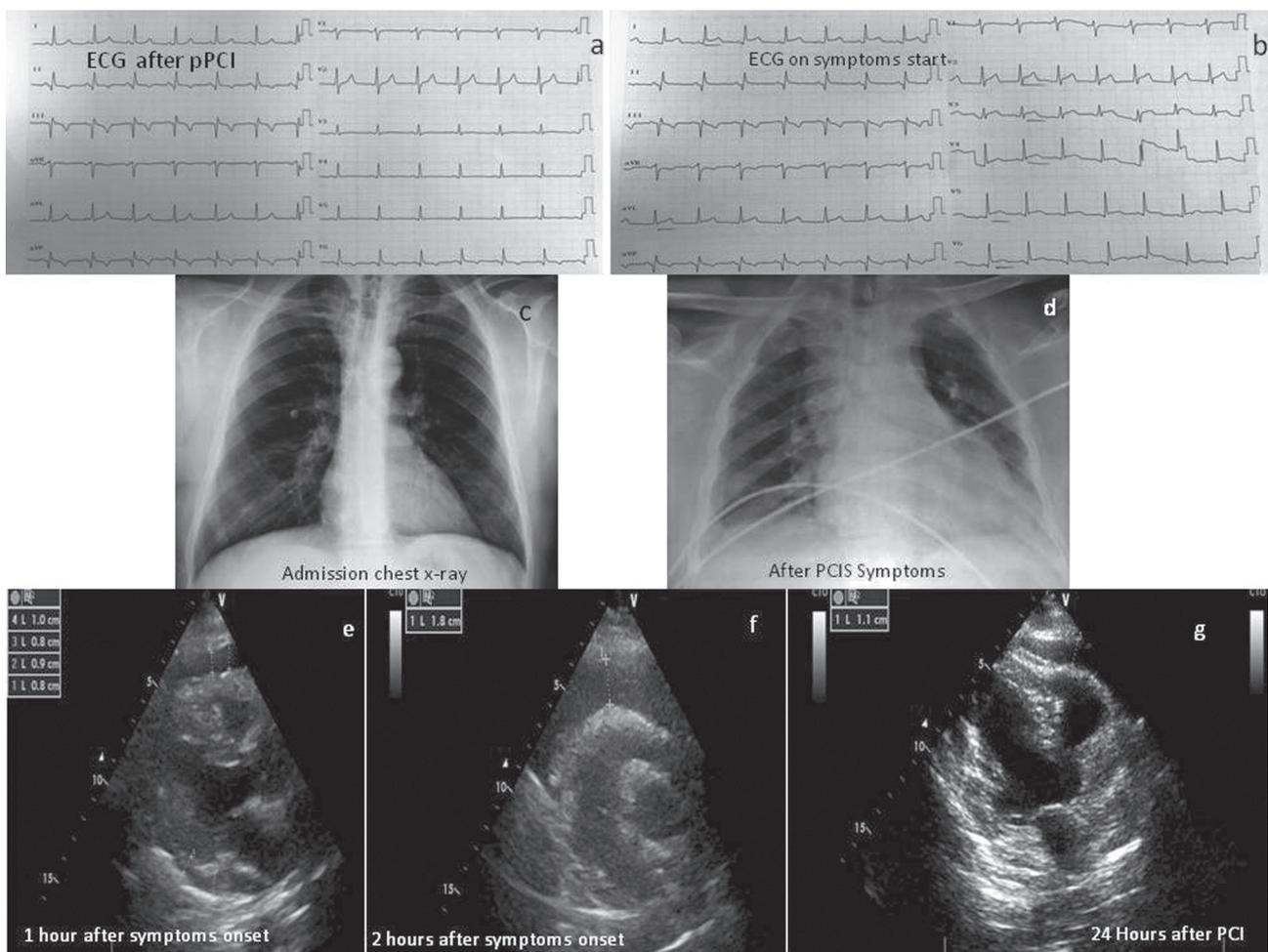


FIGURE 2. a. Post PCI ECG. b. ECG 30 minutes later on symptoms onset with ST segment elevation in all leads. c. Chest X-ray at admission. d. Chest X-ray within one hour after symptoms onset showing bilateral pleural effusion. e. and f. Pericardial effusion growing fast within 2 hours after symptoms onset. g. Pericardial effusion regression 24h later.

examination revealed rales at both lung bases, while the serum creatinine kinase and high-sensitivity troponin-I levels were not suggestive of a new ischemic event. The lab results indicated the presence of inflammation; the WBC count ($19.4 \times 10^9/L$), erythrocyte sedimentation rate (ESR, 90 mm/h), and serum CRP levels (22.39 mg/dl, normal range <0.3) were all elevated. The new chest X-ray that was performed showed bilateral pleural effusions (Fig. 2c,d). The bedside echocardiogram revealed the presence of a small pericardial effusion (Fig. 2e), that was not evident in the echocardiogram performed at the patient's admission and a day after the first PCI. The serial echocardiograms that were performed showed a gradually expanding (from small to medium) pericardial effusion within an hour of symptoms onset (Fig. 2f), followed by dyspnea and chest pain intensification. No common echocardiographic findings of cardiac tamponade, such as collapse of cardiac chambers were observed. Our diagnosis was that the patient had an acute pleuropericarditis (PCIS) and he was immediately started on methylprednisone and aspirin. The patient clinically improved within 24 hours with a significant decrease in the pericardial effusion (Fig. 2g), whereas the inflammatory markers gradually decreased. His hospitalization was thereafter uncomplicated and he was discharged 10 days later with the recommendation to be followed-up at our outpatient department. Discharge medication included: Aspirin, ticagrelor, atorvastatin, ramipril, metoprolol, methylprednisone, with instructions of tapering, pantoprazole and colchicine. At one-month follow-up the patient was asymptomatic with no pericardial effusion.

DISCUSSION

The term PCIS describes the occurrence of pericarditis during the post-myocardial infarction period or post-pericardiotomy or post-cardiac trauma.¹ PCIS also has been observed after invasive cardiac procedures.^{2,3} The diagnosis depends on the characteristic clinical and imaging features often supported by laboratory findings like leukocytosis, elevated ESR and serum CRP level.¹ In order to diagnose PCIS at least two of the following features have to be met: fever without alternative causes, pleuritic chest pain, friction rub and evidence of new or worsening pleural or pericardial effusion.⁴

The pathogenesis of the PCIS is not completely understood. An injury-mediated activation of autoimmune mechanism involving circulating myocardial antigens and initiation of antigen specific responses have been suggested which leads to a generalized inflammatory response and pleuropericarditis.¹ Detectable anti-myosin antibody titers occur actually in every case of PCIS and are positively correlated with syndrome's severity.¹ Another reported mechanism suggests that endothelial injury and leakage of blood into the pericardial space may trigger PCIS development.³ PCIS after acute myocardial

infarction (AMI) appears to have largely disappeared in the reperfusion era and has been reported in only 0.5% of patients after thrombolysis.⁵ Imazio et al, demonstrated that early PCIS after AMI (within the first 4 days after AMI) in the primary PCI era is recorded in about 4% of patients, related to late presentation (>6 hours delay) and PCI failure.⁵

In our case PCIS developed very early, which to the best of our knowledge is one of the few cases reported in the literature with a rapid PCIS onset after multi-stenting PCI. A literature review revealed only three cases of early PCIS after stenting, one case four hours post-PCI, and the other two, three hours after the procedure.^{2,3,6} The rapid clinical and laboratory manifestations in combination with the prompt response to the aspirin/prednisone treatment allows us to characterize it as acute PCIS, well-described but not fully understood. The numerous failed attempts to place a wire in the OM2 followed by complex intervention (wire switching, kissing balloon, post-dilatation with non-compliant balloon) may have caused prolonged, permanent endothelial damage enough to induce PCIS. This endothelial injury combined with negative remodeling due to the recent acute myocardial damage (sympathetic system activation with epinephrine and renin-angiotensin system involvement) may have induced the expression of adhesion molecules on the endothelial cells to which recruited inflammatory cells adhere and translocate to the arterial wall. As a result, an acute phase reaction, like the one mounted during an inflammatory response, may be provoked, with mast cell and macrophage activation, causing the release of cytokines, including IL-1, IL-6, TNF- α , and acute-phase proteins able to induce an immune response, expressed as pleuropericarditis due to mechanical injury. Subsequently, the released proinflammatory cytokines and chemokines could have resulted in the immune reaction that caused the acute PCIS. Another potential pathophysiological mechanism, given the fact that the PCIS occurred three days after the STEMI, may be the prior stimulation of the immune system due to the release of cardiac antigens as a result to the injury caused by the recent STEMI.

Prevention is not usually an issue in pericarditis during the post-myocardial infarction period due to its low incidence.⁷ However, PPS significantly contributes to morbidity in patients after cardiac surgery. Postoperative colchicine decreased the risk of PPS with the cost of increased gastrointestinal adverse effects which reduced the potential benefits of colchicine in this setting.^{8,9}

First-line drugs to treat PCIS are anti-inflammatory NSAID, such as ibuprofen, and colchicine. As there are no randomized controlled trials addressing specific treatment approaches for PCIS, treatment decisions must be taken with care given the potential side effects and risks associated with NSAID and colchicine in cardiac and post-surgery patients.⁷ Aspirin is preferred for patients already under antiplatelet

therapy and known coronary artery disease. Administration of steroids is required only for a minority of patients with contraindications for NSAIDs and aspirin, known connective tissue disorders, severe renal failure or in case of refractory and severe symptoms.⁷ In our case, due to the rapid onset of symptoms and the patient's severe clinical condition, administration of methylprednisone and aspirin was decided for immediate symptom relief.

CONCLUSION

This is a report describing the occurrence of acute inflammatory response, in the setting of a demanding PCI, leading to the under-diagnosed clinical entity of PCIS. Complex multi-stenting PCI of severe calcific lesions may provoke the development of PCIS and clinicians should be aware of its rare rapid occurrence in order to diagnose it fast and treat it properly.

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