CASE REPORT

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Acute pulmonary oedema during cardiac resynchronization therapy device implantation: management with the activation of intra-aortic balloon pump

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In this report, we present the case of two patients who experienced the development of acute pulmonary oedema during biventricular pacemaker implantation for cardiac resynchronization therapy. In both the cases, the activation of an intra-aortic balloon pump improved the clinical condition and the operation could be completed, which would otherwise have to be postponed.

Introduction

Cardiac resynchronization therapy (CRT) implantation may occasionally be hampered by adverse clinical events,[1] which could even lead to cancellation of the procedure. In this case report, we described the case of two patients who experienced the development of acute pulmonary oedema during CRT implantation in whom the activation of intra-aortic balloon pump (IABP) helped complete the procedure.

Case report

The clinical characteristics of two patients are being summarized in Table 1.

Case 1

A 50-year-old hypertensive female patient with idiopathic dilated cardiomyopathy (CMP) was referred to our clinic with a recent history of resuscitated cardiopulmonary arrest, secondary to documented ventricular fibrillation (VF). She also had a history of multiple hospital admissions because of decompensated heart failure. She remained New York Heart Association (NYHA) class IV despite optimal medical therapy. Her coronary angiogram revealed normal coronary anatomy. In her electrocardiography, a left bundle branch block (LBBB) was observed. Echocardiography with tissue Doppler imaging (TDI) revealed severe left ventricular (LV) systolic dysfunction with an ejection fraction of 11% and an intraventricular dyssynchrony of 68 ms. Although no arrhythmia was induced in the electrophysiological study (EPS), eventually, it was decided to implant CRT-D due to documented VF. Cephalic vein cut-down was performed. The anatomy of coronary sinus was complicated (highly tortuous, small vessel size, and high takeoff angle), and acute pulmonary oedema developed 25 min after coronary sinus cannulation, during which her blood pressure was 100/80 mmHg and heart rhythm was sinus tachycardia, 150 b.p.m. The procedure was postponed for 10 days till the patient was sufficiently stabilized. During the initial phase of the second attempt, acute pulmonary oedema developed again 30 min after the subclavian vein puncture, IABP was introduced through the right femoral artery, and counter-pulsation was activated at 1:1 ratio with maximum augmentation. A bolus of 5000 IU IV heparin was applied. Dyspnoea faded in a few minutes, after which we decided to continue with implantation. The LV lead could not be implanted because of the small size of the target vessel and high tortuosity. The ICD lead and right atrial lead with a biventricular ICD generator (CONTAK RENEWAL 4 HE, Guidant Corp., St Paul, MN, USA) were successfully implanted without any other procedure-related complication. The IABP could be weaned-off 3 h later. The LV lead was implanted epicardially by mini-thoracotomy 3 days later. The clinical status of the

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Table 1 Clinical and echocardiographic characteristics of two patients

	Patient 1	Patient 2
Age (years)	50	63
QRS (ms)	180	120
Pre-implant LVEF (%)	11	20
Post-implant LVEF (%)	35	22
Pre-implant mitral regurgitation	Moderate	Moderate-severe
Post-implant mitral regurgitation	Mild	Moderate
Coronary artery disease	−	+
Diabetes mellitus	−	+
Smoking	−	−
Family history	−	+
Pre-implant creatinine (mg/dL)	1.0	1.3
Post-implant creatinine (mg/dL)	1.0	1.4
Pre-implant septal-lateral wall delay (ms)	68	100
Procedure time (min)	135	170
Contrast dose (mL)	120	80
Need for intubation	−	−
Pre-implant medications	β-Blocker, ARB, furosemide, and amiodarone	β-Blocker, ACE-I, furosemide, digitalis, amiodarone, and statin
Post-implant medications	β-Blocker, ARB, furosemide, spironolactone, amiodarone, and digitalis	β-Blocker, ACE-I, furosemide, amiodarone, digitalis, trimetazidine, and statin

LVEF, left ventricular ejection fraction; ACE-I, angiotensin-converting enzyme-inhibitors; ARB, angiotensin-receptor blockers.

patient improved dramatically, and at 24 months follow-up, she had no further hospitalizations with an ejection fraction of 35% and her NYHA class decreased from IV to II.

Case 2

A 63-year-old female, hypertensive, and diabetic patient was admitted to our clinic with a diagnosis of ischaemic CMP. The patient had a history of old myocardial infarction and sporadic episodes of sustained monomorphic ventricular tachycardia (SMVT), which had been successfully converted to sinus rhythm by amiodarone infusion and direct current cardioversion. She had multiple hospitalizations owing to decompensated heart failure in the previous 3 months. Electrocardiogram showed LBBB pattern. Echocardiography coupled with TDI detected a low ejection fraction of 20% with a significant intraventricular delay of 100 ms. In the EPS, SMVT was induced. Because she was in NYHA class III despite optimal medical therapy, a CRT-D implantation was planned. After the LV lead had been positioned via cephalic vein cut-down, she developed acute pulmonary oedema with hypotension during the implantation of ICD lead. Because she did not improve with IV medication, including inotropic support, an IABP was activated at 1:1 ratio with maximum augmentation. A bolus of 5000 IU IV heparin was applied. The patient recovered immediately, and she tolerated the rest of the procedure with no further complications as ICD lead, right atrial lead, and the biventricular ICD generator (CONTAK RENEWAL 4 HE, Guidant Corp.) were implanted successfully. The IABP was removed 4 h later. During 12-month-follow-up, the patient was readmitted to the hospital only once owing to decompensated heart failure. Ejection fraction on follow-up was 22%.

Discussion

The success rate of CRT implantation is about 90%, however, the operation could be hampered by such complications as acute heart failure worsening.[1] To the best of our knowledge, the incidence of acute pulmonary oedema during this procedure is uncertain. In this report, we presented two patients who experienced the development of acute pulmonary oedema, which improved shortly after the activation of IABP.

There are some possible mechanisms to explain why acute pulmonary oedema developed in these patients during the implantation. First, both the patients had very poor LV systolic function and stayed in supine position during a long-lasting procedure. Secondly, a considerable amount of contrast material which could have a depressant effect on an LV function[2] was being used during the positioning of LV lead. Thus, the contrast material used during a very long-lasting procedure could also have provocated the acute worsening. Finally, anxiety related to the operation might have aggravated the acute decompensation secondary to sympathetic over-activity, as it is widely observed in patients with chronic heart failure,[3] and could make the clinical scenario much more complicated.[4]

Another option in a similar scenario would be postponing the procedure and implanting the CRT device in another session. However, re-operation poses patients to many additional risks associated with wound site and subclavian

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puncture. Both the patients improved haemodynamically after the activation of IABP, and the implantations were successfully completed other than the epicardially implanted LV lead in Case 1. No other procedure-related complications were observed.

In conclusion, activation of IABP may be a safe and beneficial option for completing the procedure in patients experiencing acute heart failure worsening during CRT implantation. This approach could eliminate both the need for re-operation and diminish the associated risks.

Conflict of interest: none declared.

References

1. Abraham WT, Fisher WG, Smith AL, Delurgio DB, Leon AR, Loh E *et al*. MIRACLE study group. Multicenter insync randomized clinical evaluation. Cardiac resynchronization in chronic heart failure. *N Engl J Med* 2002;**346**:1845–53.
2. Bettmann MA, Bourdillon PD, Barry WH, Brush KA, Levin DC. Contrast agents for cardiac angiography: effects of a nonionic agent vs. a standard ionic agent. *Radiology* 1984;**153**:583–7.
3. Patel H, Shafazand M, Schaufelberger M, Ekman I. Reasons for seeking acute care in chronic heart failure. *Eur J Heart Fail* 2007;**9**:702–8.
4. Ma Y, Li HC, Zheng LL, Yu HL. Hemodynamic changes in depressive patients. *J Zhejiang Univ Sci B* 2006;**7**:133–7.

CASE REPORT

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Reversing cardiac resynchronization therapy non-responder status in a patient with a surgically placed epicardial left ventricular lead by switching to an active fixation coronary sinus lead

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This report describes the reversal of a cardiac resynchronization therapy non-responder status in a patient with a surgically placed left ventricular lead by the use of a newly available active fixation coronary sinus lead.

Case report

We report on a 55-year-old man with dilated cardiomyopathy. His left ventricular ejection fraction (LVEF) was 18% at the first presentation. He was in New York Heart Association (NYHA) stage III, despite of optimized medical therapy. Heart transplantation was considered as an option, but the patient also showed a complete left bundle brunch block. Therefore, he received a cardiac resynchronization therapy (CRT) defibrillator system in June 2006. Two dislocations of the coronary sinus (CS) lead occurred and, finally, a surgical approach was chosen. An epicardial (EPI) left ventricular (LV) lead was placed via left lateral thoracotomy. As the patient's condition did not improve (NYHA class III, brain natriuretic peptide (BNP) levels 3800 pg/mL, and LVEF 15%) during the next months, he was admitted for further evaluation. The pacemaker check revealed normal sensing and pacing thresholds, and his electrocardiogram appeared to show biventricular pacing with a reduction in the QRS width by 30 ms. Tissue Doppler imaging revealed the presence of asynchrony, despite formal correct biventricular pacing.

A review of the lateral X-ray revealed that the EPI lead was placed antero-laterally close to the right ventricular lead (*Figure 1*). The distance between the RV and the EPI leads equalled only about 25% of the total cardiac antero-posterior diameter. Therefore, a fourth revision was performed in February 2007, and a newly available active CS lead (model 4195, 'Starfix', Medtronic Inc., Minneapolis, MN, USA)[1] could be successfully placed in a stable postero-lateral position, which is now very distant to the RV (*Figure 1*). Details of the implant procedure have been described elsewhere.[1] The

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