Intensive Care Med (2011) 37:1223–1224
DOI 10.1007/s00134-011-2186-4

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Myocardial ischaemia and weaning failure: is angioplasty the heart of the problem?

Accepted: 29 December 2010
Published online: 11 March 2011

Dear Editor,

We report the case of a 79-year-old patient admitted to our medical intensive care unit with acute respiratory distress because of an amiodarone-induced interstitial pneumonia, for which refractory hypoxaemia required intubation. Chronic ischaemic heart disease, with 40% of left ventricular ejection fraction (LVEF), was controlled by medical treatment. Although coronary angiography 1 year previously had shown severe stenosis of the left anterior artery, no revascularization had been performed to date.

A first weaning process was attempted after 10 days of mechanical ventilation after gradual improvement in respiratory function with corticosteroids and antibiotics. Levels of brain natriuretic peptide (BNP) and troponin, and the values of LVEF and filling pressures are presented in Table 1. Electrocardiography showed diffuse disorders of repolarization, but no deviation from baseline (Fig. 1, ECG 0). There was no proof of infection and no signs of neuromyopathy. On day 14, we performed planned extubation after a successful spontaneous breathing test of 2 h, with pressure support at 7 cm H_2O and zero positive end expiratory pressure.

Weaning failed due to an ischaemic cardiogenic pulmonary oedema which required emergency reintubation. The levels of both BNP and troponin increased (Table 1), with negative T waves in the anterior territory (Fig. 1, ECG 1). An interstitial syndrome with bilateral atelectasis developed, as shown by thoracic radiography. The decrease in systolic function required the introduction of diuretics and dobutamine at a dose of 8 μg/kg/min. A second spontaneous breathing trial was performed 1 week after reintubation following further improvement in cardiorespiratory function as a result of treatment with dobutamine at 8 μg/kg/min. A documented myocardial ischaemia occurred, with acute ST elevation in the anterior territory (Fig. 1, ECG 2) and an increase in the troponin level. Echocardiography showed impaired LVEF under dobutamine, anteroapical akinesia, and increases in filling pressures.

Then, on day 25, the patient was transferred to the cardiology department, where coronary angiography was performed and showed diffuse coronary artery disease (Fig. 2a). Severe stenoses of the left anterior artery (90%) and diagonal artery (70%) were treated by transluminal angioplasty and insertion of two stents (Fig. 2b). After angioplasty, troponin and BNP levels slowly decreased. Stable LVEF allowed gradual dobutamine weaning. On day 30, a prolonged spontaneous breathing test allowed extubation with a preventive non-invasive ventilation relay. No ischaemic complications occurred, as evidenced by decreases in troponin and BNP levels (Table 1), and regression of repolarization disorders (Fig. 1, ECG 3). The non-invasive ventilation was stopped 48 h later, without any respiratory distress.

In conclusion, we report a prolonged weaning failure from mechanical ventilation because of pulmonary oedema on myocardial ischaemia, for which we opted for an aggressive strategy with coronary revascularization. This case shows how difficult the weaning process can be in patients with coronary disease, where the switch from assisted to spontaneous breathing can lead to ischaemic myocardial dysfunction [1]. On the other hand, cardiologists are commonly reluctant to perform angioplasty in ICU patients because

Table 1 Evolution of troponin and BNP levels, and values of LVEF and filling pressures in major cardiovascular events during hospitalization

	Admission (day 0)	First weaning process (day 10)	Reintubation (day 14)	Second weaning process (day 21)	Before angioplasty (day 25)	After angioplasty (day 30)
BNP (pg/ml)	221	1,831	3,830	3,363	2,990	1,400
Troponin (ng/ml)	0.04	0.4	1.5	6	2.75	0.8
LVEF (%)	40	40	30	30	30	40
E/e′	10	11	15	15	14	11

E/e′ ratio of E and e′ waves for evaluation of left ventricular filling pressures
BNP, normal values <100 pg/ml; troponin, normal values <0.05 ng/ml; LVEF, normal values 63 ± 6%; E/e′, low <8, high >12

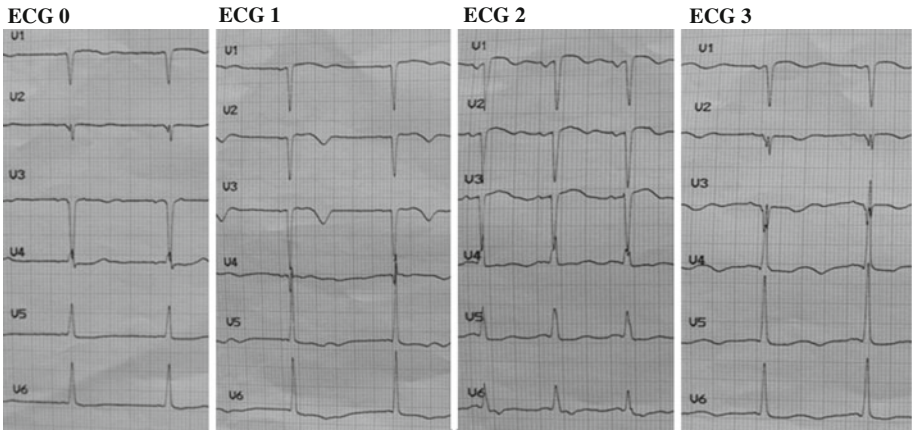

Fig. 1 Electrocardiography. Baseline ECG on admission (*ECG 0*) shows diffuse repolarization disorders in the anteroseptal territory. ECG during the first weaning attempt (*ECG 1*) shows negative T waves in the anterior territory. ECG during the second weaning attempt (*ECG 2*) shows acute ST elevation in the anterior territory. ECG 7 days after angioplasty (*ECG 3*) shows regression of ST elevation and negative T waves in the anterior territory

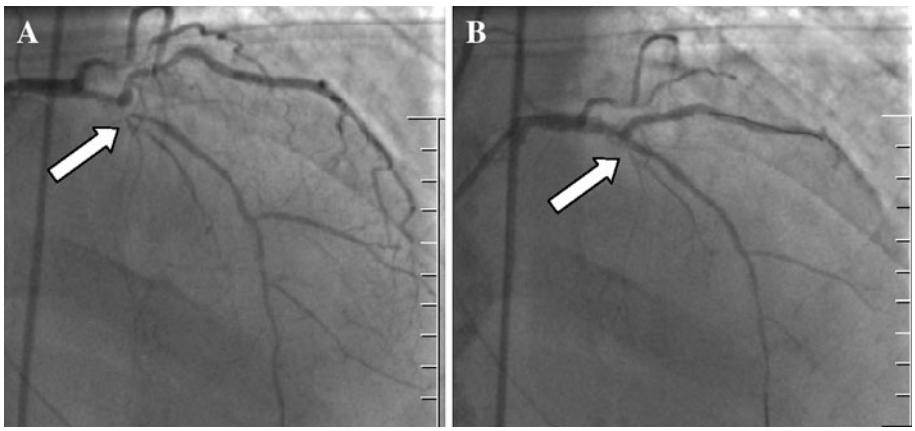

Fig. 2 Anteroposterior projection of the left coronary system. **a** Before angioplasty, left anterior artery 90% stenosed. **b** Better coronary flow after transluminal angioplasty and stent insertion

of potentially high levels of inflammation, which is a risk factor for early restenosis [2]. However, in the present patient, the improvement in coronary perfusion following angioplasty contributed significantly to the success of weaning and extubation.

Despite the known pathophysiological relationships between myocardial hypoperfusion and weaning failure [3], and the high frequency of weaning-induced myocardial ischaemia [4], this strategy is not proposed in currently available guidelines [5]. Surprisingly, it is only the second report of such a case [6]. The strategy requires the assessment and monitoring of patients at risk of silent ischaemia, especially during the stress of ventilator weaning. Further studies are needed to clarify the role of angioplasty in the most difficult cases, which require close collaboration between intensivist and interventional cardiologist.

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