Transplant International

LETTER TO THE EDITOR

ECMO as a bridge to transplantation in biventricular dysfunction due to primary spontaneous coronary artery dissection

doi:10.1111/j.1432-2277.2008.00805.x

(…)

The overall number of patients requiring extra-corporeal membrane oxygenation (ECMO) support is considerable; however, its use as a bridge to HTx in patient with (…) spontaneous coronary artery dissection (SCAD) due to eosinophil arteritis has never been reported and only few cases of successful HTx after left ventricular assist device (L-VAD) have been described [1].

SCAD has been defined as an intramural haematoma of the coronary artery wall which occludes the true lumen, determining blood flow obstruction and acute myocardial ischemia without any obvious causes [2]. Use of oral contraceptives and arterial wall changes during pregnancy have been advocated as facility factors, nevertheless the occasional report of SCAD in men suggest that other factors are involved (..) [3]. Systemic hypertension, (…) cystic medial necrosis and intense coronary vasospasm, caused by strong emotional stresses (…) have rarely been reported as the cause of coronary artery dissection (…) [4]. Some authors affirm that it may be caused by inflammatory mechanism with release of dangerous substances against the wall of the coronary arteries [5]. Finally, the possibility that an intramural haematoma and unknown alterations of the collagen tissue turns out in a SCAD, may be considered [6]. (…) Some of these factors have been observed in the case following described.

A 37-year-old woman (blood type O+) presented to the emergency care unit of a peripheral hospital with abdominal and ongoing chest pain associated to dyspnea. In anamnesis she had history of smoke, use of oral contraceptives, colon diverticula and previous use of high estrogens dose to induce pregnancy. EKG showed atrial fibrillation and inferior ST-segment elevation. The increase in creatine kinase-MB and troponine confirmed the diagnosis of acute myocardial infarction. Transthoracic echocardiography showed a preserved left ventricular function and mild hypokinesia of the inferior and basal segments. Subsequent echo showed left ventricular function worsening (EF 15%) and diffuse hypokinesia. Angiography showed an unexpected finding: SCAD involved left main trunk, anterior descending artery (LAD) (Fig. 1) and right coronary artery (RCA) (Fig. 2) but EKG showed only inferior ST-segment elevation.

(…) Intra-aortic balloon pump was inserted and the patient underwent coronary artery bypass graft (CABG): left mammary artery was grafted on LAD and two segments of saphenous vein were grafted on obtuse marginal and RCA. CABG failure was probably related to the long interval between myocardial infarction and surgery. Despite good flow measurements, weaning from ECC was impossible and the surgeons of the peripheral hospital (which had in their availability only ECMO) used this support to ensure patient's survival, positioning the inflow cannula in the right atrium and the outflow in the ascending aorta and maintaining the flow around 75% of the ideal: left ventricular vent was not used because pulmonary circulation was well decompressed by the right atrial cannula as checked by us with echo. To prevent pulmonary atelectasis, lungs were ventilated and hemogasanalysis was stable. ECMO advantages in this case were the easiness of implantation, its widespread availability

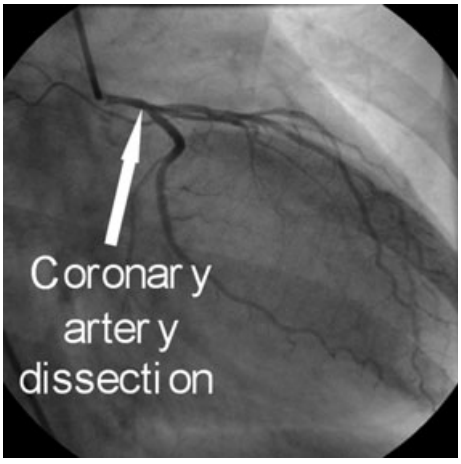

Figure 1 Dissection of main trunk and anterior descending artery (LAD).

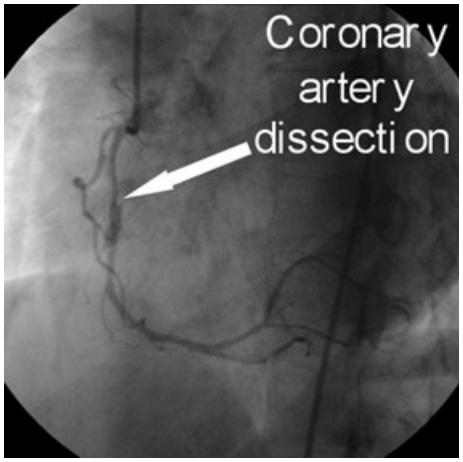

Figure 2 Dissection of the right coronary artery (RCA).

(…) and (…) simple management despite its short duration and big dimension.

ECMO circuits (Medtronic-Cameda Bioactive Surface) and oxygenator (Maquet Oxygenator – Quadrox Bioline Coating) that we usually use are heparin coiled and this allows to maintain low activation clotting time (ACT) values: in this case in fact ACT was between 180 and 200 s and we regulated i.v. heparin administration respecting this value. (…) The hypothesis of myocardial recovery (…) was strongly believed and several attempts of ECMO weaning were performed, without success. Considering that the high-risk CABG, the worsening of myocardial function, the increase in N-Terminal-pro-B-type Natriuretic Peptide (NT-proBNP) [7], the ineffective attempts of ECMO weaning suggested poor possibilities of recovery and for the incoming renal failure, we decided to enrol the patient on the waiting list for urgent HTx. Despite there is general agreement about the necessity of a period longer than 2 days for myocardial recovery but considering above-mentioned multiple negative factors, we switched this young patient to heart transplantation preventing multiple organ failure. Other VADs for long-term support were not considered for the biventricular dysfunction and the small size of the patient.

(…) Two days later, she underwent orthotopic HTx: preoperative cross-match was completely negative without humoral-mediated reactivity. Mechanical ventilation was stopped 7 days later and the patient was discharged from ICU on ninth postoperative day (POD) and from the department on 21st POD. An episode of acute graft rejection treated with high steroids doses occurred. Sixth month follow-up showed a complete recovery of physical condition and echocardiogram was normal.

We had another unexpected finding from the histological examination of the heart that showed a large myocardial infarction of the antero-septal wall, confirmed SCAD while coronary artery walls in the spared vessels were normal (..) but evidenced the eosinophils vasculitis associated to myocardial oedema around coronary artery involved in SCAD.

(…)

Few studies described eosinophils coronary vasculitis in patients with Churg-Strauss syndrome, mainly as a postmortem recognition [8] or as occasional diagnosis in patient with recent appearance of dyspnea and with intraoperative diagnosis of eosinophilic endomyocarditis [9]. Even if there are no evidences of angiographic coronary disease, eosinophils vasculitis determines ischemic myocardium [10], probably due to endothelial dysfunction that may promote SCAD. Just few studies reported cases of isolated eosinophils coronary vasculitis in patients without other symptoms as in our case and some authors suggest that this is a new pathological finding [11,12].

However, the use of ECMO after SCAD as a ''bridge to transplantation'' has never been reported; moreover, isolated eosinophils vasculitis is very rare and the case of heart transplantation for SCAD due to eosinophils vasculitis has never been described previously.

In conclusion, SCAD must be considered in young patients without cardiac risk factors but with signs of myocardial ischemia, and the use of an old assist device like ECMO as a bridge to transplantation in case of biventricular dysfunction for SCAD is an effective opportunity to ensure patient's survival.

Francesco Patanè, Massimo Boffini, Fabrizio Sansone,
Antonio Campanella and Mauro Rinaldi
Division of Cardiac Surgery, University of Turin,
San Giovanni Battista Hospital,
C.so Bramante, Turin

References

1. Ferrari E, Tozzi PG, Karl von Segesser L. Spontaneous coronary artery dissection in a young woman: from emergency coronary artery bypass grafting to heart transplantation. *Eur J Cardiothorac Surg* 2005; **28**: 349.
2. Basso C, Morgagni GL, Thiene G. Spontaneous coronary artery dissection: a neglected cause of acute myocardial ischaemia and sudden death. *Heart* 1996; **75**: 451.
3. Hinojal YC, Di Stefano S, Florez S, *et al.* Spontaneous coronary artery dissection postpartum: aetiology and controversies in management. *Ital Heart J* 2004; **5**: 563.
4. Yoshida K, Mori S, Tomari S, *et al.* Coronary artery bypass grafting for spontaneous coronary artery dissection: a case report and a rewiew of the literature. *Ann Thorac Cardiovasc Surg* 2000; **6**: 57.

5. Robinowitz M, Virmani R, McAllister HA Jr. Spontaneous coronary artery dissection and eosinophilic inflammation: a cause and effect relationship? *Am J Med* 1982; **72**: 923.
6. Bonnet J, Aumailley M, Thomas D, Grosgogeat Y, Broustet JP, Bricaud H. Spontaneous coronary artery dissection : case report and evidence for a defect in collagen metabolism. *Eur Heart J* 1986; **7**: 904.
7. Rothenburger M, Stypmann J, Bruch C, *et al.* Aminoterminal B-type pro-natriuretic peptide as a marker of recovery after high-risk coronary artery bypass grafting in patients with ischemic heart disease and severe impaired left ventricular function. *J Heart Lung Transplant* 2006; **25**: 596.
8. Val-Bernal JF, Mayorgaa M, Garcıa-Alberdia E, Pozueta JA. Churg–Strauss syndrome and sudden cardiac death. *Cardiovasc Pathol* 2003; **12**: 94.
9. Ramakrishna G, Connolly HM, Tazelaah HD, Mullany CJ, Midthun DE. Churg Strauss syndrome complicated by eosinophilic endomyocarditis. *Mayo Clin Proc* 2000; **71**: 631.
10. Vallejo E, Mendoza-Gonzalez C, Aranda A. Churg-Strauss syndrome and myocardial perfusion SPECT imaging. *J Nucl Cardiol* 2004; **11**: 358.
11. Taira K, Tsunoda R, Watanabe T, Fujino A, Ogyu A, Ashikawa K. An autopsy case of isolated eosinophilic coronary periarteritis: a limited form of Churg-Strauss syndrome or a new entity? *Intern Med* 2005; **44**: 586.
12. Lepper PM, Koenig W, Möller P, Perner S. A case of sudden cardiac death due to isolated eosinophilic coronary arteritis. *Chest* 2005; **128**: 1047.

