Complete endovascular management of severe symptomatic aortic stenosis combined with multi-level vascular disease

Background
Advanced age is the most common reason for patients in need of surgical aortic valve replacement (SAVR) to be excluded from receiving this treatment; furthermore, elderly patients are often affected by multi-level vascular disease. Severe vascular involvement in the coronary or cerebral circulations significantly increases the risk of conventional surgery. Transcatheter aortic valve implantation (TAVI) is rapidly emerging as an alternative to SAVR in high-risk patients, and, like other endovascular treatments, it may prove particularly appropriate for complex cases.

Percutaneous coronary intervention (PCI) is indicated before TAVI in unstable patients or in patients with severe coronary artery disease, and symptomatic or bilateral severe carotid artery disease needs treatment before considering open heart surgery.

We report the case of an elderly patient with severe symptomatic aortic valve stenosis (AVS) and critical multi-level vascular disease.

Case presentation
A 79-year-old lady with a medical history of hypertension, dyslipidaemia and stage 3 chronic kidney disease (CKD), with known severe AVS was referred to our laboratory for pre-operative catheterization.

She had experienced angina during daily activities for almost one year (Canadian Cardiovascular Society class II), but had experienced rapid worsening of chest pain during minimal effort over the past month. She had also had a previous transient ischaemic attack six months before, with right hemisphere signs and symptoms. The patient was kept on medical treatment because of her advanced age. However, she presented at the Emergency Department because of a clear syncopal episode, and was advised to be admitted to hospital to undergo cardiovascular screening in preparation for aortic valve replacement.

Investigations
An electrocardiogram showed sinus rhythm with signs of left ventricular hypertrophy. A chest X-ray confirmed enlargement of the heart silhouette, without signs of significant pulmonary disease. Renal function was moderately impaired (calculated serum creatinine clearance ranged from 40–55 mL/min/1.73m²). A transthoracic echocardiogram (ECG) confirmed the severe AVS...
maximum gradient: 114 mmHg, mean gradient: 55 mmHg, valve area: 0.38 mm²/m², with well-preserved left ventricular function, ejection fraction: 65%). Doppler ultrasound of the carotid arteries showed severe bilateral stenosis of the internal carotid arteries. A coronary angiogram revealed a severe stenosis (90%) at the ostium of the left main trunk (fig. 1A,B). Right heart catheterization established moderate pulmonary hypertension (pulmonary arterial systolic pressure: 40 mmHg). A selective carotid angiogram was performed in the same diagnostic suite, and confirmed severe bilateral stenosis of both internal carotid arteries (fig. 2A,B).

Differential diagnosis
The case was discussed within the Heart Team and with the patient and her relatives. The rapid worsening of the patient’s anginal status and the neurological episode in a patient with severe bilateral carotid stenosis and a logistic EuroSCORE of 41% were considered to expose the patient to a substantial risk of morbidity and mortality after a combined coronary bypass plus SAVR surgery. The possibility of a staged, fully endovascular treatment strategy was discussed, given the following considerations: 1) the favourable coronary anatomy and angiographic aspect of the disease of the left main coronary trunk; 2) the feasibility of carotid artery stenting (CAS) in a vulnerable plaque-carrying artery, despite the challenge of a tortuous common and internal carotid arteries; 3) the good quality of the peripheral circulation at the iliac-femoral level as an access site for TAVI; and 4) the extensive experience of our interventional cardiologists in coronary, structural and peripheral endovascular procedures.

Management
The angioplasty of the left main trunk was performed through a 6 French radial access with direct implantation of a second-generation drug-eluting stent at the ostium, followed by high pressure post-expansion using a non-compliant balloon, and under intravascular ultrasound monitoring, with an excellent final result (fig. 3A,B). The patient experienced immediate relief of angina already during the post-PCI period in hospital, and one week later she underwent CAS of the right internal carotid artery. After positioning a distal embolic protection filter, a 7 x 40 mm self-expandable meshed stent was implanted using an extra-support buddy wire to address the marked tortuosity of the proximal vessel. Post-dilatation with a 5 mm balloon was performed after stenting (fig. 4A, B). Clinical follow-up was
uneventful and the patient was discharged for a brief period of rehabilitation.

Two weeks later, the patient was readmitted for TAVI. A totally percutaneous approach was planned after pre-implantation of a dedicated vascular closure device. Aortic balloon dilatation was performed under rapid pacing before valve implantation with a 21 x 40 mm balloon. A 23 mm SAPIEN (Edwards) prosthesis was implanted under rapid pacing, with a good immediate result (fig. 5A,B,C). The post-operative period was uneventful and the patient was discharged one week later with the recommendation of following dual anti-platelet therapy with 100 mg of aspirin per day and clopidogrel 75 mg every two days for six months, and aspirin alone thereafter. We recommend Clopidogrel 75 mg every other day in old patients with low weight because we have observed frequent bleeding in such patients when full dose dual anti-platelet regimens are used after discharge. This rationale is also applied in ACS patients over 75 years and with low weight.
So far, the patient has undergone clinical follow-up at two years since the combined procedure and remains in functional New York Heart Association class I, and completely free of other cardiovascular symptoms.

ECG tests have confirmed good function of the implanted valve, and Doppler ultrasound examinations have excluded restenosis of the carotid stent.

**Take-home messages**

- Treatment of elderly patients with multi-level vascular disease is complex and needs thorough evaluation by a multidisciplinary team.
- The reduced invasiveness of endovascular procedures may prove particularly appropriate in elderly and fragile patients with multi-level vascular disease and severe symptomatic AVS.
- Elective multi-level endovascular procedures should always be staged, and not performed in a single session, to reduce the risk of procedure-related complications and contrast-induced renal damage.

**Call for case studies!**

Do you have a case study you would like to share with Confluence and its readers?

A template describing the format for your case study report can be found at the end of this issue. The case report should be no more than 1,000 words (written in a Word document or similar) and submitted to confluence@confluencejournal.com by Friday 1 March, 2013.

We look forward to hearing from you!