Masters of Cardiothoracic Surgery

Sorin Perceval S aortic valve implantation through a mini-sternotomy approach

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Clinical vignette

We describe a case of a 78-year-old female with chronic obstructive pulmonary disease (COPD), diabetes, obesity, impaired renal function and severe aortic valve stenosis with associated insufficiency (*Video 1*). The patient was symptomatic for dyspnea (class NYHA III). Her medical history included breast cancer treated with mastectomy two years prior. The logistic Euroscore was 19.17%. After echocardiographic evaluation which excluded significant coronary artery disease, a minimally invasive sutureless aortic valve replacement (AVR) was planned.

Surgical techniques

Preparation

In a standard operating room, general anesthesia and orotracheal intubation were performed. External defibrillation pads were placed on the chest before skin disinfection. For minimally invasive surgery, patients require intraoperative monitoring by transoesophageal echocardiography for the management of cardiopulmonary bypass (CPB) and the evaluation of prosthesis function.

Exposure

The heart was exposed through an upper mini J-sternotomy extended to the fourth intercostal space.

Operation

After systemic heparinization, the ascending aorta and the superior vena cava (SVC) were cannulated and the patient placed on CPB. SVC cannulation can be done through a mini-incision and allows better exposure of the aortic root by its shifting of lateral structures. We used a 29 French cannula (Venous Optiflow Cannulae, Sorin Group, Mirandola, Italy) inserted through the SVC in the right atrium which facilitates excellent venous drainage in the majority of cases by the action of gravity alone. The procedures are always performed during aortic cross-clamping (ACC) and interrupted antegrade infusion of warm cardioplegia (Calafiore protocol). A transverse aortotomy was done about 1 cm distal to the sino-tubular junction so that the valve stent did not interfere with closure of the aortotomy after device implantation. The calcified native aortic valve was removed and the aortic annulus was decalcified.

The ease of passage of the sizer through the annulus into the ventricle was evaluated (e.g., if the sizer "S" passed without difficulties into the ventricle, a prosthesis "M" would be chosen). The Perceval was inserted in the collapsing area. While supporting the prosthetic valve holder, the lever was gently turned until the inflow ring and outflow ring had collapsed. The holder knob was turned counterclockwise in the direction of the closed-lock until it stopped, thus allowing the inflow cap to grip the inflow ring, maintaining it also in a collapsed position. The sliding sheath was subsequently pushed forward until it stopped and had covered the collapsed outflow ring. The safety clip was repositioned on the holder and the prosthesis was then ready for implantation. During prosthesis collapse, three guiding threads were positioned in the lowest part of the native leaflet insertion line for each valve sinus (monoply 4/0) as reference points for accurate alignment of the inflow section of the prosthesis with the insertion plane of

the native leaflets. At the prosthesis level, each thread was passed into a corresponding slot. The release device was inserted into the aorta to the point where it was blocked by pulling on the previously positioned thread guides. Once loaded into the delivery device, the valve prosthesis was released in two phases: opening of the inflow section (knob) followed by the outflow part (sheath). Once the prosthesis was completely deployed, the thread guides were removed. To optimize the area of contact between the prosthesis and the aortic annulus, a post-implant dilatation of the inflow part of the valve was performed using a balloon catheter. The prosthesis was rinsed out with warm water during dilatation. Transesophageal echocardiography was performed intraoperatively for valve assessment.

Completion

After weaning from CPB, two drainages were placed and the sternum was closed with standard steel wires. The ACC and CPB times were 34 and 52 minutes respectively. The patient was transferred into the intensive care unit (ICU) for post-operative monitoring. Six hours after the end of operation, the patient was successfully extubated. Bleeding in the 24-hour post-operative period was approximately 300 mL. In the second post-operative day, the drains were removed and the patient was moved out of the ICU. The rest of the in-hospital stay was uneventful and the patient was discharged on her eighth post-operative day.

Comments

Clinical results

In our institution, 238 patients were treated with a Perceval S bioprosthesis as isolated AVR or combined procedures (coronary artery bypass grafting, mitral valve replacement, tricuspid valve repair, left atrial appendage closure, interatrial defect closure, ascending aorta replacement). In a recent propensity-matched analysis (1), we demonstrated the superiority of this prosthesis (and the consequent reduced ACC and CPB) when compared to a traditional prosthesis in terms of intubation times, ICU stay duration, incidence of post-operative paroxysmal atrial fibrillation, pleural effusions and need for blood transfusions. It was found that a Perceval S bioprosthesis use resulted in significantly better outcomes for high-risk patients and reduced resource consumption for the hospital.

Advantages

The Perceval S bioprosthesis is collapsible. This makes it easier to implant, especially in minimally invasive approaches [not only with J-sternotomies but also with right mini-thoracotomies (2)]. Another advantage is that this prosthesis is self-anchoring, and there is no need for complete annular decalcification. Finally, Ranucci and colleagues demonstrated that ACC is an independent risk factor for post-operative mortality (3). Since Perceval S bioprostheses have been found to reduce operation, ACC and CPB times, they could be an important instrument for minimizing complications in high-risk patients.

Caveats

Despite promising preliminary results, our longest follow-up is at the moment of four years. A longer follow-up is warranted before a definite conclusion can be drawn.

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