Editorial

The AngioVac system as a bail-out option in infective valve endocarditis

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Tricuspid valve endocarditis is frequently observed in intravenous drug addicts and *Staphylococcus aureus* is the most common causative organism (1,2). Antibiotic therapy is the first-line treatment in such patients and according to the 2015 ESC guidelines for the management of infective endocarditis surgery should be considered in the case of the following situations (3):

- Micro-organisms that are difficult to eradicate or bacteremia for more than 7 days, despite adequate antimicrobial therapy;
- Persistent tricuspid valve vegetations larger than 20 mm after recurrent pulmonary emboli, with or without concomitant right heart failure;
- Right heart failure secondary to severe tricuspid regurgitation with poor response to diuretic therapy.

In cases where surgery is recommended, operative risk assessment is important to decide whether the risk-benefit analysis supports performance of surgery.

In recent years, several case reports and case series have introduced a novel, minimally-invasive technique using a percutaneous aspiration system to debulk tricuspid valve vegetations in patients with a high operative risk. This concept of debulking tricuspid valve vegetations aims to reduce bacterial load in order to allow antimicrobial therapy to cure the infection or to stabilize the patient as a bridge to surgery (4-8).

The transcatheter aspiration system, used in such cases, is based on an extracorporeal circuit used in a veno-venous configuration with an in-line filter system. To approach the tricuspid valve, the right internal jugular vein is used as a site of access for the AngioVac drainage cannula (Angiodynamics, USA). The aspiration procedure is guided by transesophageal echocardiography (TEE) and fluoroscopy, which allows for immediate monitoring of procedural success and potential intra-procedural complications.

Between June 2015 and December 2018, 78 patients (49 male, 29 female) were treated at our center with a percutaneous aspiration procedure for different indications. In 60 cases (76.9%), indication for the percutaneous aspiration procedure was due to infectious diseases: 57 cases with pacemaker and ICD lead vegetations in patients with systemic infections of cardiac implantable electronic devices (CIED). There were 2 patients with vegetations of central venous catheters and 1 patient with tricuspid valve endocarditis. Overall, complete procedural success of the aspiration procedure for all infectious indications was observed in 55 cases (91.7%), partial procedural success in 4 cases (6.7%) and failure in 1 case (1.6%).

Below, the case of the percutaneous aspiration procedure for debulking of the tricuspid valve endocarditis is described in more detail.

A 57-year-old male patient was admitted due to tricuspid valve endocarditis in severe sepsis with hemodynamic compromise. Blood cultures were positive for *Staphylococcus aureus* (MSSA). Furthermore, the patient required continuous hemofiltration due to acute renal failure, and also suffered from an upper gastrointestinal bleed, requiring laparotomy due to obstructive ileus.

TEE revealed a 12 mm × 17 mm vegetation on the septal

leaflet of the tricuspid valve and showed mild tricuspid valve regurgitation. Despite adequate antibiotic therapy for more than seven days, the patient remained septic. According to guidelines, the patient therefore qualified for tricuspid valve surgery. Due to the critical condition of the patient, the associated high operative risk, and an individual risk-benefit analysis, a multi-disciplinary decision was made to perform a percutaneous removal of the tricuspid valve vegetation with the use of the AngioVac system (Angiodynamics, USA).

The percutaneous debulking procedure was performed in a right internal jugular vein-right femoral vein configuration in a hybrid operating room under fluoroscopic and TEE guidance. The mobile part of the tricuspid valve vegetation was aspirated successfully. The septal leaflet of the tricuspid valve remained thickened and regurgitation remained low-grade post-procedure.

In the post-operative course, the patient recovered from sepsis. 18 days post-procedure, TEE control revealed recurrence of vegetation on the tricuspid valve, with worsened regurgitation. At this point of time, the patient's condition had stabilized, and he was a suitable candidate for tricuspid valve surgery. The patient underwent successful tricuspid valve repair, recovered uneventfully and was transferred to the referring hospital on the 8th post-operative day.

Initial results of the use of this percutaneous aspiration technique to remove tricuspid valve vegetations have shown successful procedural outcomes with low complication rates (4-8). George *et al.* published a retrospective single-center analysis of 33 patients (72.7% injection drug use) with large tricuspid valve vegetations (average size 2.1±0.7 cm) and a high operative risk, who received the percutaneous aspiration procedure to reduce vegetation size. The authors reported 61% size reduction after the procedure. There was no operative mortality and survival of the index hospitalization was 90.9%. Of these patients, 9.1% (n=3) required tricuspid valve surgery in the extended time-course due to deterioration of tricuspid regurgitation (9).

It is important to emphasize that this technique remains a bail-out in patients with tricuspid valve endocarditis, who theoretically qualify for valve surgery, but carry a high operative risk due to co-morbidities or a critical state of illness. The goal in these patients is to reduce the infectious load in order to allow antibiotic therapy to clear bloodstream infection or to achieve stabilization of the patient as bridge to surgery.

Despite excellent safety data being published, this procedure carries a potential for serious procedural complications (e.g., vascular or myocardial injury, pericardial tamponade, tricuspid valve injury, pulmonary embolism), which implies that it is performed by cardiac surgeons or at least with cardiac surgical backup. Operation of the extracorporeal circulation requires the presence of a perfusionist. The ideal operative environment for this procedure is a hybrid operating room.

The overall (globally) small number of patients treated with this bail-out technique represents a relevant limitation of data interpretation. This technique certainly requires further investigation based on larger patient cohorts. In patients with tricuspid valve endocarditis and failure of medical therapy, it will be important to prospectively evaluate the effect of this technique on mid- and long-term survival, as well as endocarditis recurrence.

Extending this concept of percutaneous vegetation debulking to valves other than the tricuspid valve has not been reported and does not seem reasonable.

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Footnote

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