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BEGINNER

CASE REPORT: CLINICAL CASE

Unmasking Severe Tricuspid Valve Regurgitation After Percutaneous Debulking of Large Tricuspid Vegetation

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ABSTRACT

A 27-year-old man admitted with tricuspid valve endocarditis with a large vegetation, persistent bacteremia, and pulmonary and systemic septic embolization was deemed not a suitable surgical candidate. He underwent percutaneous vegetation debulking using the AngioVac system. The patient defervesced post-operatively with clinical improvement but with abruptly worsened tricuspid regurgitation. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2021;3:818–22) © 2021 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

A 27-year-old homeless man was transferred from an outside facility with malaise and fatigue. Physical examination revealed a thin, diaphoretic male subject. His blood pressure was 101/54 mm Hg, heart rate was regular at 92 beats/min, and S1 and S2 were normal with no parasternal lift, gallop, or murmur. Neck veins were distended, and temperature was 102.7°F. There were coarse crackles bilaterally on lung auscultation. Results of the patient's initial laboratory evaluation were pertinent for neutrophilic leukocytosis. During the patient's hospital stay, he continued to deteriorate clinically, developing hemoptysis and lower back, left hip, and ankle tenderness; the latter was associated with local erythema and increased temperature. All of the symptoms were concerning for septic pulmonary and systemic embolization.

LEARNING OBJECTIVES

- To recognize the AngioVac system as a less-invasive strategy for TV endocarditis in patients who are deemed poor surgical candidates.
- To be aware that vegetation debulking may lead to resolution of bacteremia, reduction of septic embolization, and enhancement of antibiotic efficacy.
- To recognize that post-procedural long-term outcomes, including abrupt worsening of TR, are not yet well established.

MEDICAL HISTORY

The patient had a significantly challenging social environment with no family support. He had been recently incarcerated and had a history of untreated schizoaffective disorder, chronic hepatitis C, and tobacco and polysubstance abuse including intravenous drug use.

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DIFFERENTIAL DIAGNOSIS

Endocarditis was strongly suspected based on clinical presentation with differential between right-sided endocarditis versus right and left involvement.

INVESTIGATIONS

The electrocardiogram showed normal sinus rhythm with no conduction abnormalities. Blood cultures were positive for methicillin-resistant *Staphylococcus aureus* (MRSA) and remained positive for 8 days. Left ankle fluid culture grew MRSA. Transthoracic echocardiogram revealed a large 2.6 × 1 cm tricuspid valve (TV) vegetation that appeared to span almost the entire tricuspid annulus in systole (**Figure 1**). Transesophageal echocardiogram (TEE) showed the vegetation (Video 1) and a negative bubble study and no evidence of valvular or paravalvular abscess. There was no left heart involvement. An eccentric tricuspid regurgitation (TR) jet was observed and estimated to be moderate in severity (**Figure 2**, Video 2). Computed tomography imaging of the chest revealed multiple bilateral patchy infiltrates concerning for septic embolization. Given the development of low back and left hip pain, magnetic resonance imaging was obtained, which revealed several small abscesses in the left iliopsoas muscle. Ankle joint fluid aspiration grew MRSA.

MANAGEMENT

Antibiotic therapy was promptly started; however, given the patient's persistent fever, bacteremia, and septic embolization, after 8 days of medical management, cardiothoracic surgery was consulted for TV replacement. The patient was considered a poor surgical candidate due to multiple co-morbidities and social issues. After multidisciplinary team discussion, based on the lack of improvement, young age, and high mortality, it was believed that the potential benefit of the procedure outweighed the risks, and the decision was therefore made to proceed with percutaneous debulking of the large vegetation using the AngioVac venous drainage system (AngioDynamics, Latham, New York) (**Figure 3**).

Extensive debulking was performed via right internal jugular venous access (Videos 3 and 4). The patient's post-procedural vital signs remained stable with a heart rate of 78 beats/min and blood pressure of 112/56 mm Hg. His temperature decreased to 97.8°F and neutrophil count normalized with repeat set of cultures reported to be negative. However, post-procedure, TEE revealed severe TR with a prominent, holosystolic regurgitant jet (**Figure 4**, Video 5) and severe malcoaptation on transthoracic echocardiogram (**Figure 5**, Video 6).

DISCUSSION

Right-sided infective endocarditis is less common, accounting for 5% to 10% of endocarditis cases. TV is the most common site involved (90%) (1,2) and when *Staphylococcus* is the causal organism, death occurs in <5% of cases. In general, early surgical intervention is recommended in patients with persistent bacteremia, fever lasting >5 to 7 days after the onset of appropriate antimicrobial therapy, and as a Class IIb indication for patients with recurrent emboli, persistent vegetation despite antibiotic therapy, or a vegetation >10 mm in length. However, significant concern for reinfection after successful antibiotic therapy with or without surgery is present in patients with intravenous drug use. Close follow-up is therefore essential (3,4).

The AngioVac system is a vacuum-based device, U.S. Food and Drug Administration approved in 2014 for percutaneous drainage of undesirable material such as soft thrombi or emboli. The AngioVac system is composed of a venous drainage and a reinfusion cannula connected to an extracorporeal circuit and bypass pump. The device has recently been used for debulking of valvular vegetation. A retrospective analysis in patients with large TV vegetation found a similar 1-year mortality, reduced length of hospital stay, and fewer blood transfusions with percutaneous debulking compared with

ABBREVIATIONS AND ACRONYMS

MRSA = methicillin-resistant *Staphylococcus aureus*

TEE = transesophageal echocardiogram

TR = tricuspid regurgitation

TV = tricuspid valve

FIGURE 1 Transesophageal Echocardiogram Showing a Large Tricuspid Valve Vegetation

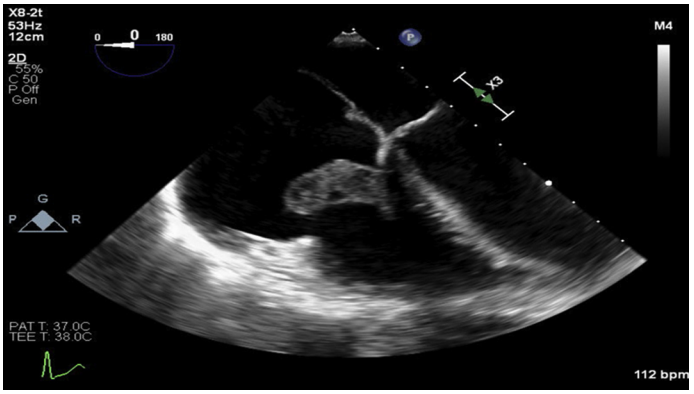
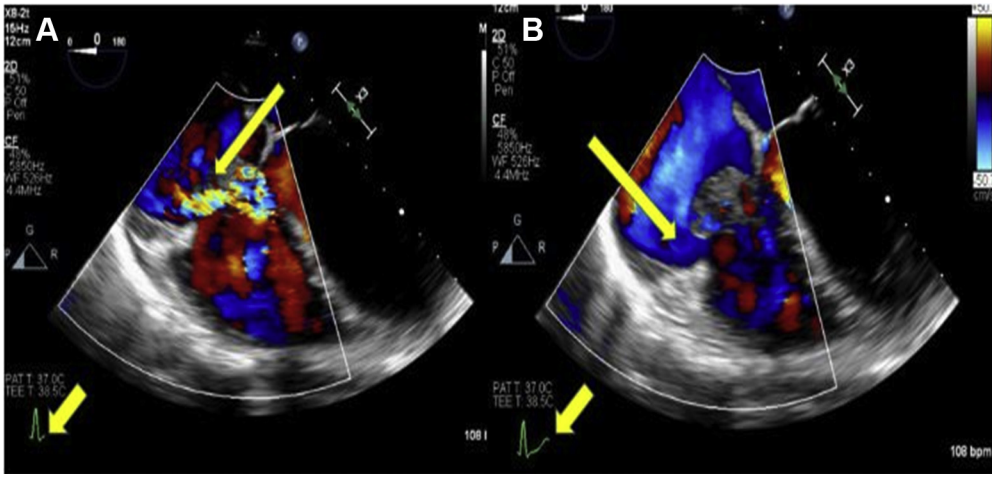


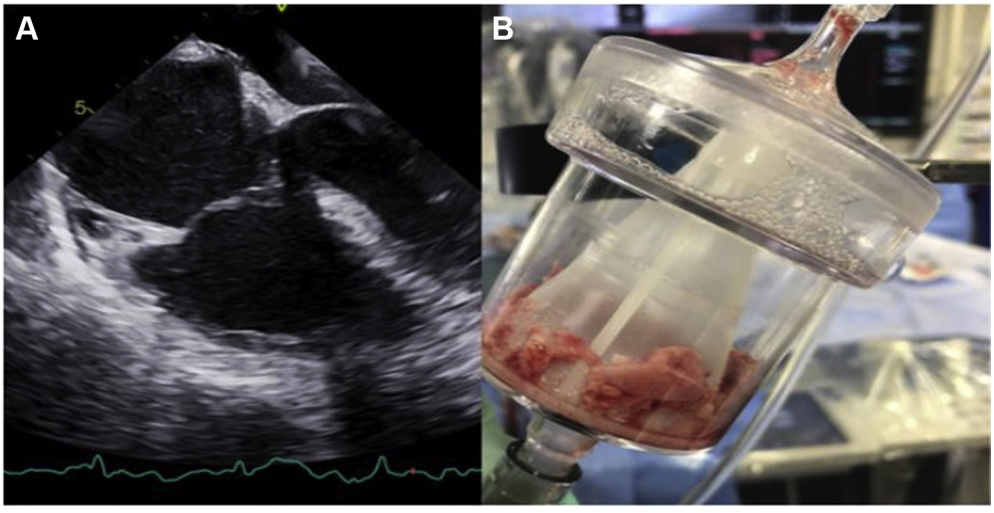
FIGURE 2 Pre-Procedure Tricuspid Regurgitation Analysis



Pre-procedure, transesophageal echocardiogram frame showing an eccentric tricuspid regurgitation jet **(long arrow)** occurring only in early systole **(short arrow) (A)**. **(B)** Visual of the absence of a jet **(long arrow)** by mid-systole **(short arrow)**.

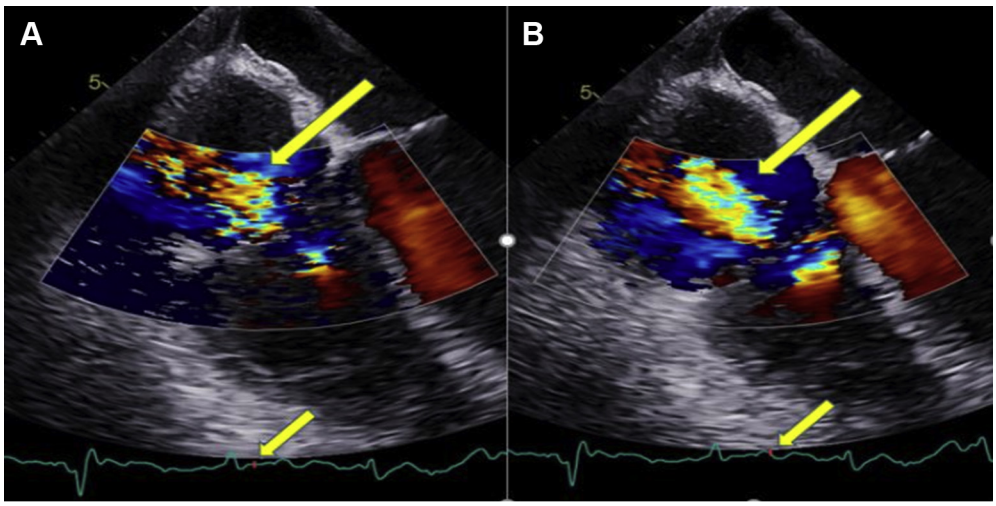
surgical intervention (5). The largest prospective study to date involved 78 patients; procedural success of the aspiration procedure was reported in 91.7% of the cases (6). The resolution of bacteremia in a total of 66 cases reviewed from different case reports/series was 87% (7,8). TR progression incidence has not been well established but was reported in one study in 14 (42%) of 33 patients who underwent TV debulking. A repeat echocardiogram was performed at a mean gap of

FIGURE 3 Vegetation Debulking



(A) Post-procedure, transesophageal echocardiogram showing significant reduction in vegetation size. **(B)** Tricuspid valve vegetation specimen.

FIGURE 4 Post-Procedure Tricuspid Valve Function Analysis



Post-procedure, transesophageal echocardiogram showing severe tricuspid regurgitation jet **(long arrow)**, that extends from early systole **(short arrow) (A)** to the end of systole **(short arrow) (B)**.

14 days' post-procedure; of those, 3 patients required subsequent TV replacement. Acute worsening of TR after use of the AngioVac system was not described (7).

The operative mortality in TV endocarditis is as high as 10%. The use of a noninvasive strategy was justified in our patient given his poor social status and high perioperative mortality risk. The patient developed hemoptysis before debulking, which increases the risk for any procedure in which anticoagulation is required. Hemoptysis is present in up to 80% of cases with septic pulmonary embolism, and although the literature is limited, the presence of septic pulmonary embolism has been reported before debulking with no observed pulmonary hemorrhage. The bacteremia resolved after the procedure. Our patient, however, experienced abrupt worsening of TR post-operatively, which could have been secondary to additional damage to the leaflets from the AngioVac procedure. More likely, severe damage to the leaflets from endocarditis was unmasked when the bulk of the vegetation impeding the regurgitant jet was removed. **Figure 2** shows the large vegetation impeding the regurgitant systolic flow before the procedure. Unfortunately, there is no way to prevent leaflet damage during the procedure if the valve has already been compromised by the infection, as most likely happened in this case based on the TEE as described earlier.

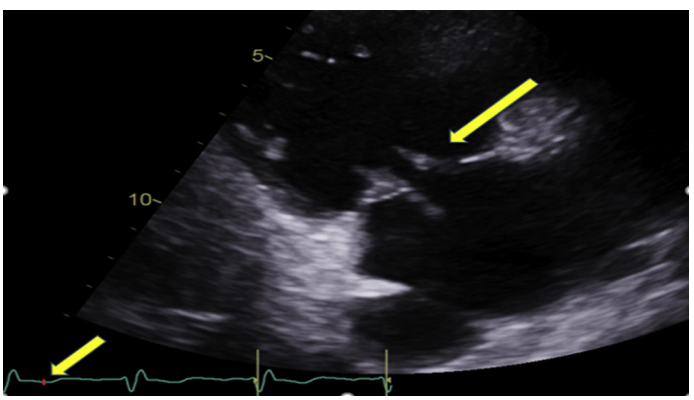
FOLLOW-UP

Unfortunately, despite a heart-felt conversation, the patient left against medical advice 36 h after the procedure.

CONCLUSIONS

The management of TV infective endocarditis in patients with intravenous drug use remains a challenge. The vast majority of this patient

FIGURE 5 Tricuspid Valve After Debulking



Post-procedure, transthoracic echocardiogram demonstrates tricuspid valve malcoaptation (**long arrow**) during systole (**short arrow**).

population lack social support, and the risk of reinfection is high. The AngioVac system is an alternative therapeutic option in unsuitable surgical candidates. This approach can also be used as a bridge to surgery with potentially lesser rates of reinfection given higher chances of resolution of the bacteremia post-procedure. Further studies are required to evaluate the frequency of abrupt worsening of TR following debulking to better understand the pathophysiology.

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KEY WORDS AngioVac System, debulking, echocardiography, endocarditis, treatment, tricuspid valve

APPENDIX For supplemental videos, please see the online version of this paper.