

CASE REPORT

INTERMEDIATE

CLINICAL CASE

Percutaneous Aspiration of Vegetation in Tricuspid Valve Infective Endocarditis



A Possible Novel Treatment Option

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ABSTRACT

A 35-year-old man with a history of active intravenous drug use presented with infective endocarditis and tricuspid valve vegetations. He was a poor candidate for open heart surgery as a result of persistent bacteremia and comorbidities, and he underwent successful aspiration therapy with a mechanical thrombectomy device for the vegetation.

(Level of Difficulty: Intermediate.) (J Am Coll Cardiol Case Rep 2022;4:1151-1155) © 2022 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 35-year-old man with a history of active intravenous (IV) drug use (IVDU) presented to his local emergency department with back pain and intermittent fever and was prescribed a 1-week course of oral levofloxacin for an infection of unknown origin.

He then presented to our hospital 2 weeks later and was admitted with severe back pain, progressively worsening shortness of breath, fatigue, and a several-week history of fever. His vital signs were as follows: blood pressure, 129/65 mm Hg; heart rate, 110 beats/min; temperature, 102 °F; and respiratory rate, 35 breaths/min. Transthoracic echocardiography

(TTE) revealed vegetations on the tricuspid valve (hospital day 1). Further imaging work-up on day 2 revealed necrotizing bilateral pneumonia and a large retropharyngeal abscess on computed tomography (CT) (**Figure 1**), as well as an epidural abscess at T8-T9 with spinal cord compression noted on magnetic resonance imaging.

PAST MEDICAL HISTORY

The patient had a history of active IVDU of methamphetamine, along with chronic hepatitis C and type 2 diabetes mellitus.

DIFFERENTIAL DIAGNOSIS

Infective endocarditis (IE) was strongly suspected given the patient's history of IVDU and the vegetations noted on TTE. The differential diagnoses included tuberculosis, fungal infection, and systemic connective tissue diseases such as sarcoidosis or vasculitis because of the multiorgan involvement with abscesses in the lungs and spine.

LEARNING OBJECTIVES

- To describe endovascular aspiration therapy as a novel alternative treatment option to surgery in IE.
- To highlight the complexity of IVDU-related IE and the importance of a multidisciplinary team approach in treating very sick patients.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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ABBREVIATIONS AND ACRONYM

- CT** = computed tomography
- ICE** = intracardiac echocardiography
- ICU** = intensive care unit
- IE** = infective endocarditis
- IV** = intravenous
- IVDU** = intravenous drug use
- MSSA** = methicillin-sensitive *Staphylococcus aureus*
- TTE** = transthoracic echocardiography

INVESTIGATIONS

Following TTE showing tricuspid valve vegetations, repeated blood cultures grew methicillin-sensitive *Staphylococcus aureus* (MSSA). Transesophageal echocardiography (day 16) revealed severe tricuspid regurgitation and large, mobile vegetations attached to the tricuspid valve, measuring 2.3 and 2.1 cm at the widest diameter. The right ventricular systolic pressure was 50 mm Hg.

MANAGEMENT

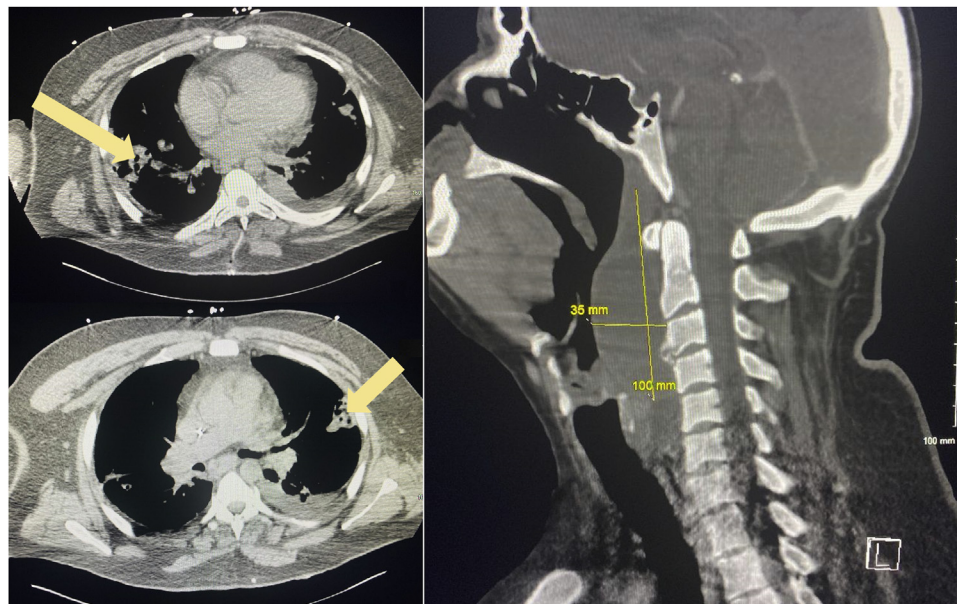
After admission, the patient was treated initially with IV vancomycin (1 g every 12 hours) and IV ceftriaxone (2 g every 12 hours). The patient was managed in the intensive care unit (ICU), where he was intubated on a mechanical ventilator on hospital day 4 as a result of hypoxemic respiratory failure. IV nafcillin (2 g every 4 hours) was then given for the MSSA.

A multidisciplinary approach was taken with otolaryngology and neurosurgery, and the patient

underwent drainage of the abscesses and decompressive laminectomy on hospital days 8 and 9. The patient's bacteremia persisted through hospital day 16 despite antibiotic treatment, and cardiothoracic surgery was consulted for the valve vegetations. The patient was considered an extremely high risk for open heart surgery because of persistent bacteremia and comorbidities, in addition to the mechanical ventilation. A less invasive endovascular option was recommended, with delayed tricuspid valve repair or replacement at least 6 months post-discharge. Catheter-based aspiration therapy was pursued (day 16) with the FlowTrievers system (Inari Medical), consisting of 24-F Trierer24 and 20-F Trierer20 Curve aspiration catheters.

Intracardiac echocardiography (ICE) demonstrated large vegetations on the tricuspid valve leaflets (Figure 2, Video 1). A 24-F aspiration catheter was navigated through the right femoral vein into the right atrium. A 20-F curved aspiration catheter was introduced coaxially through the 24-F catheter and was positioned close to the tricuspid valve vegetations under ICE guidance

FIGURE 1 Computed Tomography Scans of the Chest and Neck



(Left) Computed tomography scans of the chest showing multiple confluent cavitary lesions involving both lungs and reflecting septic emboli (arrows). **(Right)** Computed tomography scan of the neck showing a large retropharyngeal abscess with a mass effect on the airways.

(Figure 3). After performing 4 volume-controlled aspirations with the curved aspiration catheter, the majority of the vegetation was removed (Figures 4A to 4D and 5). Debulking therapy was deemed successful, and an immediate improvement in tricuspid valve regurgitation was observed.

DISCUSSION

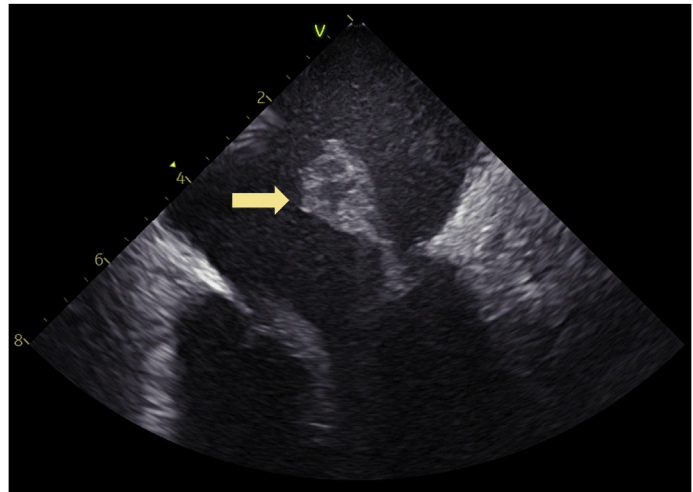
IVDU-related IE is associated with significant mortality and morbidity. Complications of IVDU-related IE include embolic events, congestive heart failure, and persistent bacteremia.¹ The incidence of right-sided IE cases related to IVDU is increasing, almost doubling from 15% in 2010 to 29% in 2015,² and it is expected to increase in tandem with the opioid epidemic in the United States.

Current guidelines recommend treating IE with antibiotic therapy, with early surgery indicated in patients with complications, including persistent infection, right-sided heart failure, recurrent emboli or persistent vegetations despite antibiotic therapy, and vegetations larger than 10 to 20 mm.^{3,4} As in our case, open heart surgery is not always feasible as a result of concomitant infections or morbidities.

Other investigators have used the AngioVac System (AngioDynamics, Inc.) for right-sided vegetation removal.^{5,6} However, the cannula and circuit system requires cardiopulmonary bypass and a perfusionist in addition to specially trained operators, factors that limit its use for tricuspid valve vegetation removal.

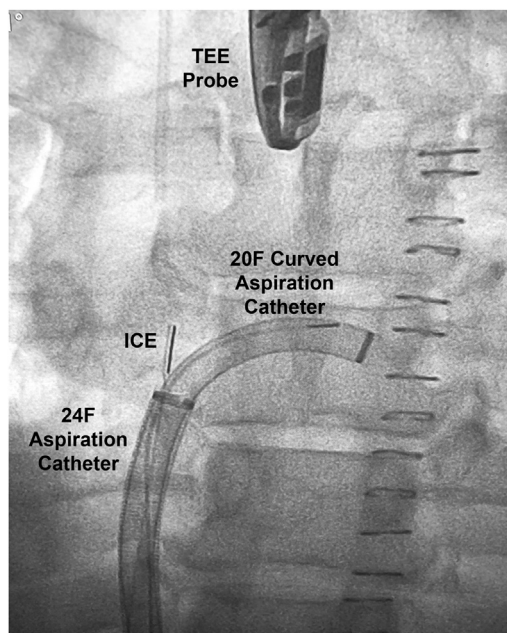
Aspiration therapy with an endovascular catheter that does not require cardiopulmonary bypass is a less invasive alternative treatment option in patients with tricuspid valve vegetation. Aspiration therapy has recently been used successfully in treating clot in transit in the right atrium,⁷⁻⁹ although the success in the right atrium cannot be extrapolated to right-sided IE given disease-related differences. The curved 20-F aspiration catheter used in this case has an adjustable curved tip capable of 260° angulation to aid in navigation in patients with difficult anatomical features. Here, we used the curved aspiration catheter to direct the aspiration force at the vegetations for successful removal. Although the novel method used for vegetation removal was successful in this patient, evidence remains at the case report level, and we acknowledge that bias may exist in publishing positive outcomes.

FIGURE 2 Pretreatment Tricuspid Valve Vegetation Shown on Intracardiac Echocardiography

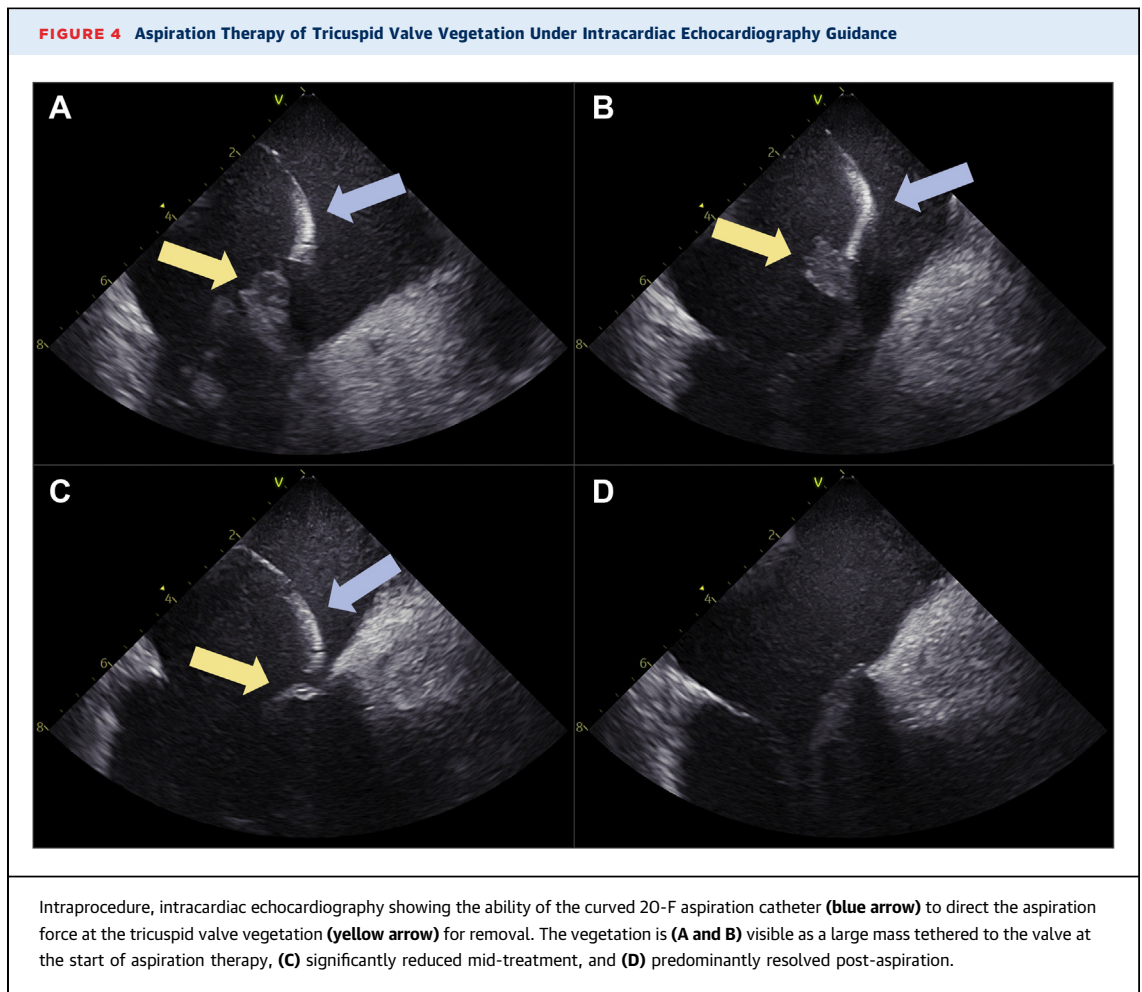


Pretreatment intracardiac echocardiography showing a large vegetation (arrow) on the tricuspid valve.

FIGURE 3 Positioning of Aspiration Catheters on Fluoroscopy Imaging



Intraprocedure fluoroscopy image showing the 20-F curved aspiration catheter in place in the right atrium for aspiration of the tricuspid valve vegetation. The 20-F catheter is coaxial within the 24-F catheter. ICE = intracardiac echocardiography; TEE = transesophageal echocardiography.



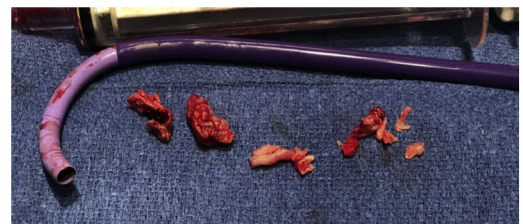
FOLLOW-UP

Following the procedure, the patient was transferred to the ICU in stable condition. The patient was successfully extubated 1-day post-procedure (hospital day 17).

On hospital day 26, he was discharged home afebrile and with negative culture results. He was treated with IV ampicillin and sulbactam for 6 weeks after discharge.

At 4-month follow-up echocardiography (**Figure 6, Video 2**), the patient remained free of vegetation regrowth and showed only mild tricuspid regurgitation. The patient has continued to do well and has

FIGURE 5 Valve Vegetation Material Extracted With Aspiration Therapy



Tricuspid valve vegetation material extracted with aspiration therapy.

avoided tricuspid valve replacement surgery out to his 7-month clinic visit.

CONCLUSIONS

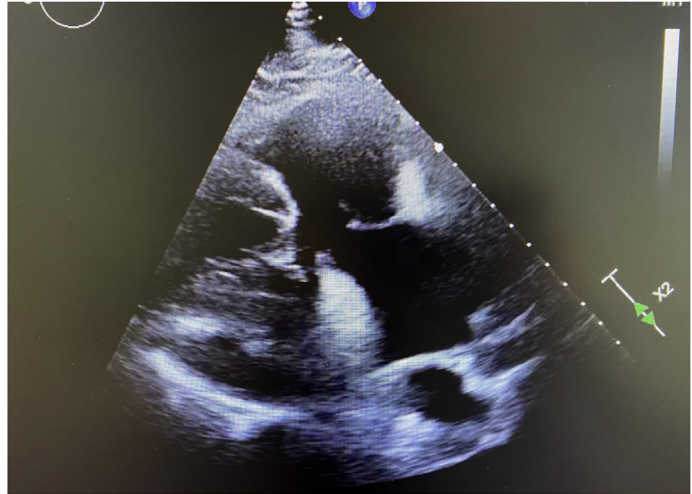
IE secondary to IVDU is becoming more common, with affected patients often precluded from surgical treatment because of the presence of related high-risk complications. Aspiration therapy is a novel, minimally invasive alternative option for valve vegetation removal that avoids cardiopulmonary bypass and open-heart surgery. Although aspiration successfully removed tricuspid valve vegetations and prevented tricuspid valve replacement surgery in our patient, further studies are warranted to clarify the role of endovascular treatment in IE.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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FIGURE 6 Follow-Up Echocardiography Showing No Tricuspid Valve Vegetation at 4 Months Post-Treatment



At 4-month follow-up echocardiography, the tricuspid valve remained free of vegetation, and the patient continued to avoid an indication for tricuspid valve replacement surgery.

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KEY WORDS aspiration therapy, infective endocarditis, tricuspid valve, vegetation

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