

# Pseudoleads on Transesophageal Echocardiography



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## INTRODUCTION

When implanted cardiac devices (ICDs) become infected, complete removal of the device generator and leads is required to curtail the dangerous consequences of infection. Following removal of infected ICDs, unaccounted-for structures, described as freely floating, mobile, echodense masses, have been reported to remain on echocardiographic examinations.<sup>1-3</sup> The etiology of these masses has been discovered as fibrin casts that have formed around the ICD leads.<sup>1,4</sup> Cardiac pseudolead casts that remain after lead extractions have implications for worsened clinical outcomes and increased mortality.<sup>5-7</sup> We describe a case in which an infected ICD was removed fully intact, but pseudoleads remained visible on subsequent transesophageal echocardiography (TEE) in a patient with recurrent bacteremia. The importance of these pseudoleads in clinical outcome and management is discussed.

## CASE PRESENTATION

A 66-year-old man with a history of coronary artery disease presented to the hospital experiencing altered mental status and high-grade fever of 39.4°C. He had undergone stenting of the right coronary artery 5 years previously, and a dual-chamber ICD had been implanted for primary prevention because of reduced left ventricular ejection fraction (25%). The patient had recently undergone pacer generator exchange and had increased pain and swelling at the exchange site. His chest bandages were removed, with noted purulent fluid expression. Intravenous (IV) broad-spectrum antibiotics were started, and he promptly underwent incision and drainage of the pacer pocket. The patient was transferred the next morning to another facility, at which his ICD was successfully removed. Blood and device cultures were positive for methicillin-resistant *Staphylococcus aureus*. The patient then completed a 30-day course of IV vancomycin. He returned to our facility 2 months later in atrial fibrillation (now without an ICD). He was also experiencing thoracic spinal pain and had a fever of 38.3°C. Laboratory testing revealed a white blood cell count of  $14.00 \times 10^9/L$ . IV broad-spectrum antibiotics were started, and blood cultures again were positive for methicillin-resistant *S. aureus*. TEE (Videos 1–4) revealed a hyperechoic line in the superior vena cava and right atrium (Figure 1) extending

through the tricuspid valve into the right ventricle. Three mobile vegetations were noted on the right side of the heart: a 3-mm mass in the superior vena cava (Figures 2 and 3), a 6-mm multilobed mass on the anterior or septal leaflet of the tricuspid valve (Figure 4), and a 5-mm mass in the right ventricle attached to what we believe to be the anterior papillary muscle (Figure 5). TEE was chosen over transthoracic echocardiography because TEE has demonstrated superiority in sensitivity and specificity for the detection of bacterial bodies in endocarditis.<sup>8-10</sup> Three-dimensional imaging did not provide any structural information about the pseudoleads that was not already noted on TEE.

The patient was placed on a diltiazem drip with subsequent oral metoprolol and converted to normal sinus rhythm. The working diagnosis at that time included retained leads from previous ICD removal. Follow-up chest radiography (Figure 6) and chest computed tomography (CT; Figures 7–9) were completed, revealing no evidence of retained foreign bodies.

Documentation of the ICD removal procedure in the patient's medical record was reviewed and discussed with the operating physician. According to the operating physician, gentle manual traction was unable to remove the lead because of significant lead-to-lead binding. Thus, the lead was cut, a locking stylet applied, and rotating mechanical dilator sheath used to successfully remove the lead in its entirety. This process was repeated for the remaining two leads. All three leads were sent for bacterial cultivation and were positive for methicillin-resistant *S. aureus*. Following completion of the procedure, no radiographic evidence of retained hardware was found. There were no complications during the removal process.

It was concluded that without radiopaque objects seen on chest radiography or CT, the intracardiac mass detected by echocardiography likely represented fibrous sheaths that had encased and formed around the pacer leads, referred to as pseudoleads. Cardiothoracic surgery was consulted and recommended medical management with IV antibiotics, similar to the treatment course for native valve endocarditis. Over his hospital stay, the patient developed shortness of breath, for which repeat noncontrast CT was completed, showing scattered soft tissue cavitory densities within the lungs, consistent with septic pulmonary emboli (Figure 10).

His back pain acutely increased, and he developed acute lower extremity paraplegia. Urgent repeat spinal magnetic resonance imaging showed epidural abscesses located at vertebrae C6–T3, with the largest located at C7 (Figure 11).

The patient declined surgical intervention and was eventually discharged to spinal cord injury rehabilitation with IV vancomycin for a total 8-week course.

## DISCUSSION

Our patient had a complicated course of recurrent bacteremia with the presence of pseudoleads on TEE after removal of an infected ICD. Pseudoleads have been documented in 8% of cases following percutaneous device extraction<sup>6</sup> and are associated with an elevated risk for recurrent infections and worsened clinical outcome.<sup>5,7</sup>

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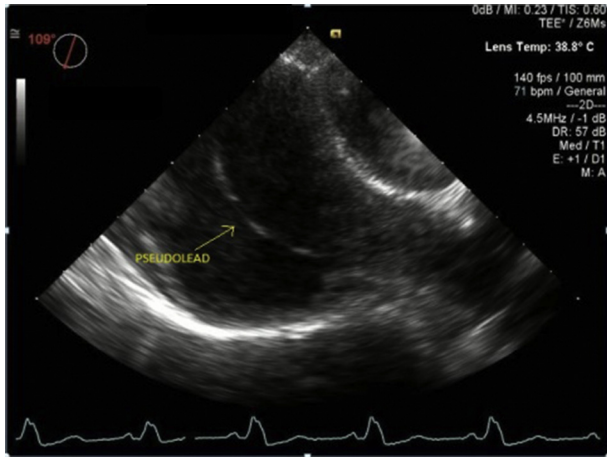


Figure 1 TEE, bicaval view: linear object noted in right atrium.

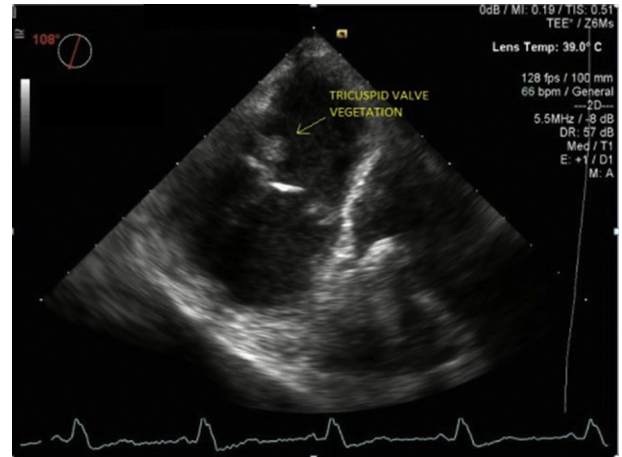


Figure 4 TEE: vegetation noted on tricuspid valve leaflet.

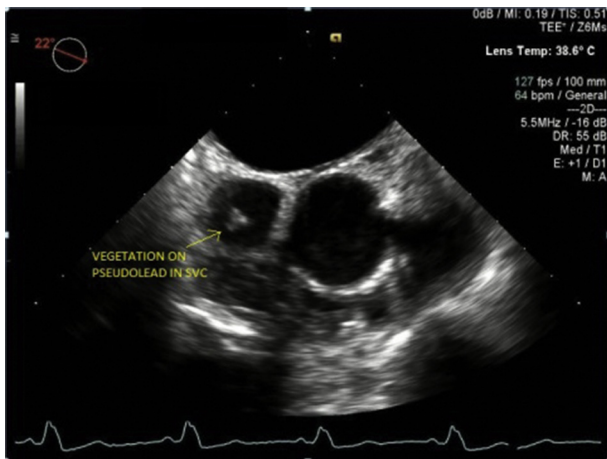


Figure 2 TEE, short-axis view: vegetation noted on pseudolead in superior vena cava.

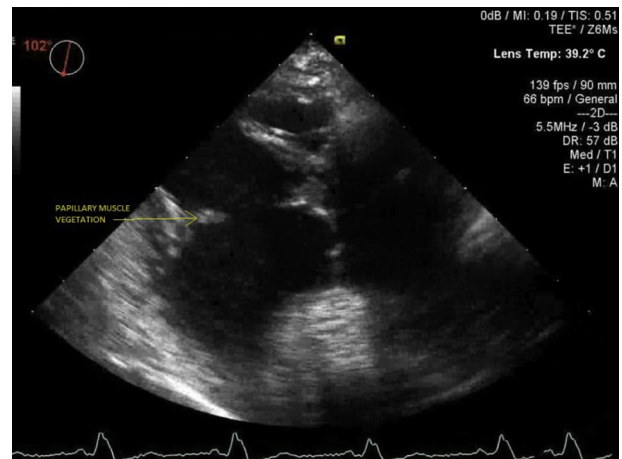


Figure 5 TEE: vegetation noted to the papillary muscle of the right ventricle (arrow).

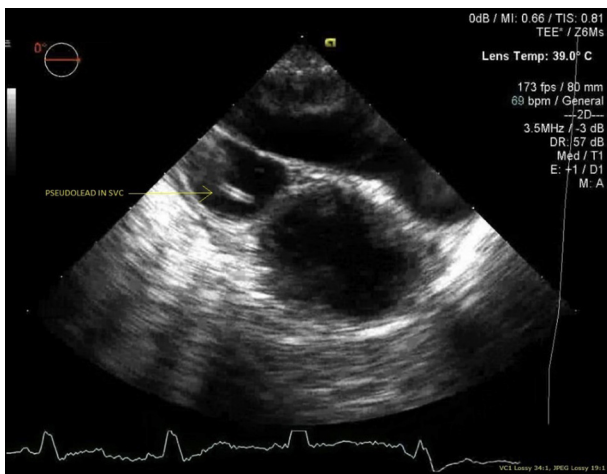
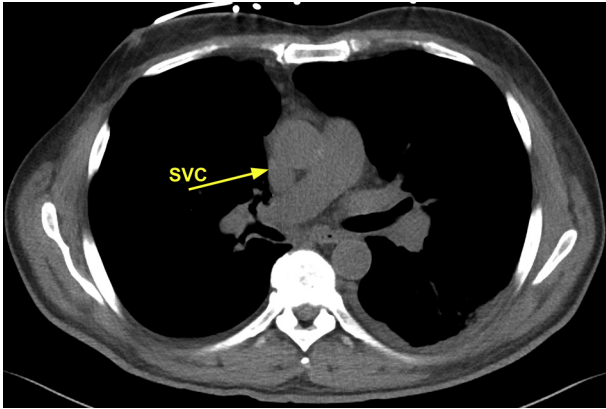


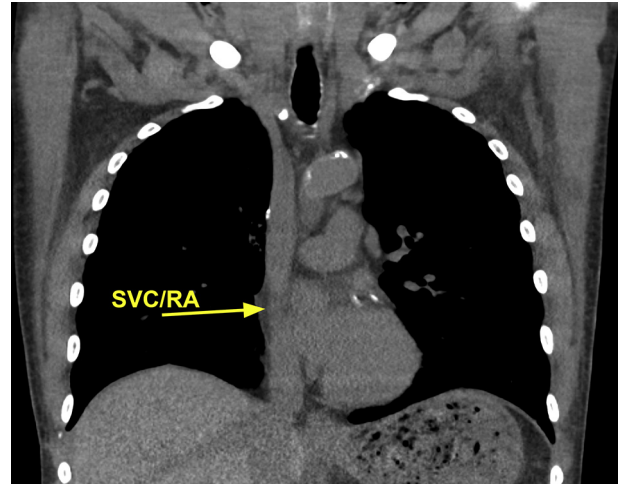
Figure 3 TEE: pseudolead noted in superior vena cava with a hypoechoic center.



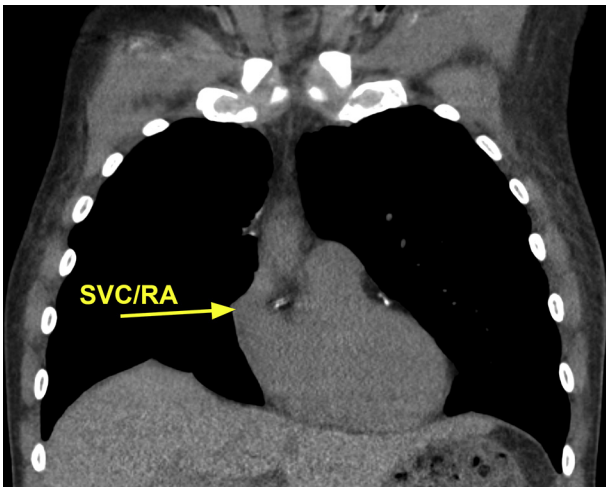
Figure 6 Chest radiography with absence of radiopaque objects.



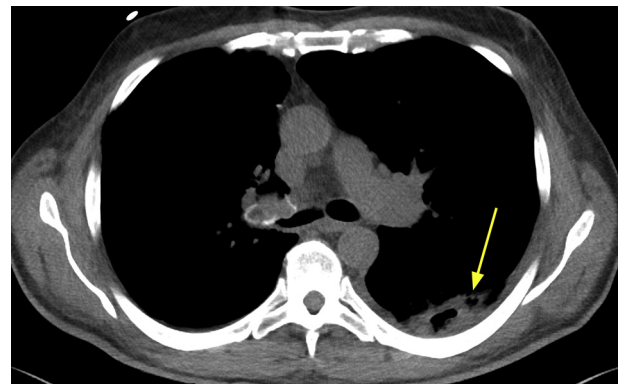
**Figure 7** Chest CT: axial view with absence of radiopaque objects.



**Figure 9** Chest CT: coronal view with absence of radiopaque objects.



**Figure 8** Chest CT: coronal view with absence of radiopaque objects.



**Figure 10** Chest CT: axial view with evidence of cavitary lesions (arrow), consistent with septic pulmonary emboli.

Discerning the metallic presence of unaccounted-for structures as seen on TEE can be accomplished by noting an absence of radiopaque objects on follow-up chest radiography or CT. Further revealing details pertaining to these unknown objects can be obtained with three-dimensional gated CT.<sup>11</sup> Previous studies have demonstrated that TEE is superior to transthoracic echocardiography in the detection of native valve vegetations. The sensitivity of transthoracic echocardiography for detecting vegetations is only 29%–55% that of TEE.<sup>8,9,12</sup> Therefore, we recommend performing TEE if clinical suspicion for pseudoleads is high.

A number of articles have been published establishing a correlation with anticoagulation and antithrombotic agents, with worsened clinical outcomes for patients with infective endocarditis.<sup>13,14</sup> In one such study, patients treated with anticoagulation therapy were shown to have a higher incidence of cerebrovascular complications and increased risk for intracranial bleeding.<sup>13</sup> Likewise, a randomized trial examining aspirin therapy for infective endocarditis found that aspirin did not significantly reduce the risk for embolic events and was associated with increased bleed risk.<sup>14</sup> On the basis of literature review, we extrapolate that anticoagulation and fibrinolytic agents are not indicated in the treatment of acute pseudolead endocarditis. They may, however, be helpful in resolving pseudoleads following resolution of

acute infection. Pseudoleads are composed of fibrinous material, and because fibrinolytics are used to degrade fibrinous clots, these agents have the potential to increase the risk for embolic complications. Further research into the effectiveness and safety profile of fibrinolytic agents for the treatment of pseudoleads is warranted.

## CONCLUSION

Management of pseudoleads has been debated and likely falls to clinical judgment. We recommend treating pseudolead infections as we would native valve endocarditis. Previous cases of surgical pseudolead extraction have included large and overtly mobile pseudoleads with elevated embolic risk.<sup>15</sup> Some suggest surgical removal of valve vegetations for uncontrolled infection (new abscess, pseudoaneurysm, enlarging vegetation, persistent fever, blood culture positive after >7–10 days on appropriate antibiotics), vegetation diameter >10 mm with evidence of embolism, or vegetation diameter >15 mm.<sup>10</sup> We do not recommend initiating antithrombotic, anticoagulation, or fibrinolytic agents during acute pseudolead infective endocarditis. In cases in which surgery is not indicated or patients decline surgical intervention, a prolonged course of IV antibiotics is likely warranted. Close follow-up is recommended for patients with pseudoleads noted on TEE.



**Figure 11** Cervical MRI with spinal abscess noted (*arrow*).

#### SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.case.2018.08.001>.

#### REFERENCES

1. Kenchaiah S, Barnes MJ, Nambudripad R, Naemi K, Tobias S. Figures in cardiovascular medicine. Rotating fibrocalcific cast after infected pacemaker lead extraction. *Circulation* 2008;117:e338-9.
2. Novaro GM, Saliba W, Jaber WA. Figures in cardiovascular medicine. Fate of intracardiac lead vegetations after percutaneous lead extraction. *Circulation* 2002;106:e46.
3. Nazir SA, Hudsmith L, Newton JD, Betts TR. Chronic fibrous sheath mistaken for retained pacemaker product. *Eur J Echocardiogr* 2009;10:343.
4. Candinas R, Duru F, Schneider J, Luscher TF, Stokes K. Postmortem analysis of encapsulation around long-term ventricular endocardial pacing leads. *Mayo Clin Proc* 1999;74:120-5.
5. Diemberger I, Biffi M, Lorenzetti S, Martignani C, Raffaelli E, Ziacchi M, et al. Predictors of long-term survival free from relapses after extraction of infected CIED. *Europace* 2018;20:1018-27.
6. Le Dolley Y, Thuny F, Mancini J, Casalta JP, Riberi A, Gouret F, et al. Diagnosis of cardiac device-related infective endocarditis after device removal. *JACC Cardiovasc Imaging* 2010;3:673-81.
7. Narducci ML, Di Monaco A, Pelargonio G, Leoncini E, Boccia S, Mollo R, et al. Presence of "ghosts" and mortality after transvenous lead extraction. *Europace* 2017;19:432-40.
8. Reynolds H, Jagen M, Tunick P, Kronzon I. Sensitivity of transthoracic versus transesophageal echocardiography for the detection of native valve vegetations in the modern era. *J Am Soc Echocardiogr* 2003;16:67-70.
9. Shively B, Gurule F, Roldan C, Leggett J, Schiller N. Diagnostic value of transesophageal compared with transthoracic echocardiography in infective endocarditis. *J Am Coll Cardiol* 1991;18:391-7.
10. Kang DH. Timing of surgery in infective endocarditis. *Heart* 2015;101:1786-91.
11. Kiuchi K, Fukuzawa K, Mori S, Nishii T, Matsumoto K, Ichibori H, et al. The details of an unusual "ghost" after transvenous lead extraction: three-dimensional computed tomography analysis. *J Arrhythm* 2017;33:640-2.
12. Abhishek B, Mohamed HY. Comparison between transthoracic and transesophageal echocardiogram in the diagnosis of endocarditis: a retrospective analysis. *Int J Crit Illn Inj Sci* 2015;5:130-1.
13. Garcia-Cabrera E, Fernández-Hidalgo N, Almirante B, Ivanova-Georgieva R, Noureddine M, Plata A, et al. Neurological complications of infective endocarditis: risk factors, outcome, and impact of cardiac surgery: a multicenter observational study. *Circulation* 2013;127:2272-84.
14. Chan KL, Dumesnil JG, Cujec B, Sanfilippo AJ, Jue J, Turek MA, et al. A randomized trial of aspirin on the risk of embolic events in patients with infective endocarditis. *J Am Coll Cardiol* 2003;42:775-80.
15. Andreas M, Wiedemann D, Kocher A, Khazen C. Materialization of ghosts: severe intracardiac masses after pacemaker lead extraction requiring immediate surgical intervention. *Heart Rhythm* 2013;10:1826.