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Debulking of Giant Right Ventricular Lead Vegetation by Percutaneous Approach Under the Direct Real-Time Intracardiac Echocardiography Visualization

Vejetasyonunun Direkt Gerçek Zamanlı İntrakardiyak Ekokardiyografi Görüntüleme Altında Perkütan Yaklaşımla Küçültülmesi

ABSTRACT

Infection of cardiac implantable electronic devices is one of the most dangerous complications, and the main treatment approach is the removal of cardiac implantable electronic device from the body. We present a case of successful lead removal of implantable cardioverter-defibrillator infection at which right ventricular lead had giant vegetation material. We performed percutaneous debulking of giant right ventricular lead vegetation by percutaneous approach under the real-time intracardiac echocardiography visualization because of the high risk of pulmonary artery embolization of giant infectious material and poor lung and general condition of the patient.

Keywords: Endocarditis, intracardiac echocardiography, lead extraction

ÖZET

Kalp içi elektronik cihaz enfeksiyonu, en tehlikeli komplikasyonlardan biridir ve ana tedavi yaklaşımı, kalp içi elektronik cihazın vücuttan çıkarılmasıdır. Bu olguda, implante edilebilen kardiyoverter-defibrilatör enfeksiyonunun sağ ventrikül leadinde devasa bir vegetasyon materyali bulunan bir vakayı başarılı bir şekilde sunuyoruz. Hastanın pulmoner arter embolizasyonu riskinin yüksek olması, akciğer ve genel durumunun kötü olması nedeniyle, gerçek zamanlı intrakardiyak ekokardiyografi görüntülemesi altında perkütan yaklaşımla devasa sağ ventriküler lead vejetasyonunun küçültülmesi işlemi gerçekleştirildi.

Anahtar Kelimeler: Endokardit, intrakardiyak ekokardiyografi, lead çıkarılması

CASE REPORT
OLGU SUNUMU

Tayyar Gökdeniz[1]
Yusuf Karavelioğlu[1]
Ümeyir Savur[2]

[1]*Department of Cardiology, Hitit University Erol Olçok Training and Research Hospital, Çorum, Türkiye*
[2]*Department of Cardiology, Medipol University Medipol Mega Hospital, İstanbul, Türkiye*

Corresponding author:
Ümeyir Savur
✉ drumeyirsavur@hotmail.com

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Infection of cardiac implantable electronic devices (CIEDs) is one of the most dangerous complications and is associated with high mortality.[1] Cardiac implantable electronic device infections are diagnosed by methods such as blood culture positivity, increased inflammatory markers, imaging of vegetation, and Positron Emission Tomography/Computed Tomography (PET/CT), and treatment is the removal of CIEDs from the body in addition to the use of antibiotics.[2] Written consent was obtained for the identifiable health information and photographs included in this case report, and the Declaration of Helsinki was complied with.

Case Report

A 59-year-old male presented to our clinic with skin erosion and battery protrusion of implantable cardioverter-defibrillator (ICD). He had a history of single chamber ICD implantation 11 years ago due to ischemic cardiomyopathy. He was hospitalized for suspicion of CIED infection with no fever and normal infection parameters (white blood cell count, C-reactive protein level, and erythrocyte sedimentation rate). Peripheral blood cultures were normal. Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) revealed a left ventricular ejection fraction (LVEF) of 30% and no infective materials. The CIED pocket was opened and cultures from the wound and

removed ICD battery were obtained. Empirical vancomycin therapy was started and continued for 2 weeks until culture results of wound materials and CIED battery and after that lead removal and completion of antibiotic therapy for 4 weeks were planned. The culture results were normal, 10 days later. The requirements for the continuation of antibiotic therapy and the removal of lead were explained to the patient. But, he did not accept the therapy continuation and wanted to discharge despite all life threated risks.

He presented to the emergency service with fever, elevated infection parameters, and deterioration of general condition 6 months later. The TTE and TEE revealed huge mobile (3.6 × 0.8 cm) infectious material over the right ventricle (RV) lead at the junction between RV and right atrium (RA) (Figure 1, Video 1). The CIED pocket had purulent exudate wound infection. The cultures from the peripheral blood and wound were obtained and empirical intravenous vancomycin therapy was started. Despite therapy, incessant and uncontrolled fever and increasing infection parameters persisted and general condition of patient deteriorated. The patient was intubated and emergency lead removal was decided. Open heart surgery was considered of high risk due to the general condition of the patient who had multi-organ failure and inotropic support, low LVEF, and impaired lung function according to consultation with cardiovascular surgery. Percutaneous lead removal was decided, but there was hesitation about high risk of huge infectious material embolization to the lungs during extraction and impaired lung function, hemodynamic instability, and resistant infection. Therefore, during lead removal, debulking of huge infectious material via a percutaneous approach was decided.

The patient underwent lead extraction and debulking of vegetation in the same procedure under general anesthesia. Eleven and 6F introducers were placed to the left and right femoral vein for intracardiac echocardiography (ICE) catheter and 12F steerable sheath (FlexCathAdvance™, Medtronic, Minn, USA), respectively. The ICE and FlexCath catheters were placed in RA. Amplatz Goose Neck 30-mm snare was advanced to RA via FlexCath catheter (Figure 2A). The vegetation was tried for debulking with snare which was introduced with steerable sheath under the direct real-time visualization of ICE (Figure 2B). After reducing vegetation size with a percutaneous approach, lead removal was performed with a lead locking device (LLD-EZ) and 11F TightRail rotating dilatator sheath (Spectranetics, USA) (Figure 2C). After lead removal, we performed pulmonary angiography which revealed that vegetation had embolized to the left pulmonary artery (Figure 2D). Figure 3 demonstrated all extracted materials including lead, vegetation and thrombus removed via percutaneous approach. Three days later, the patient was extubated and discharged after completing antibiotheraphy to 6 weeks. All procedures are shown in Video 2.

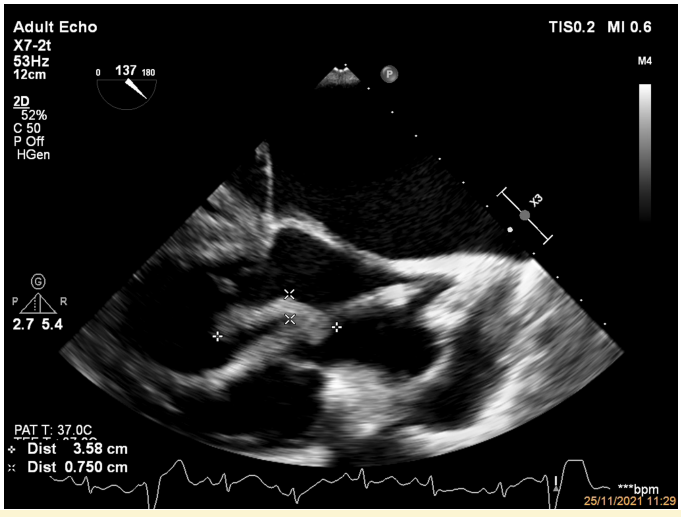

Figure 1. Transesophageal echocardiographic view of infectious material over the lead.

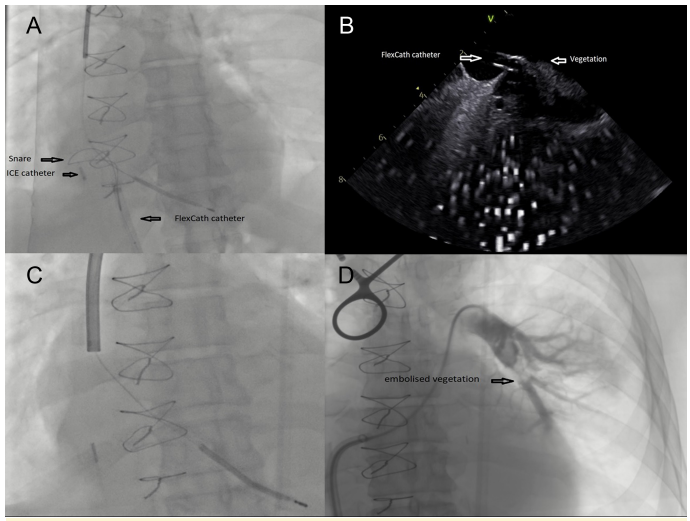

Figure 2. (A) Fluoroscopic view of ICE, microsnare, and FlexCath catheter in the RA. (B) Vegetation debulking under direct ICE visualization. (C) Fluoroscopic view of lead extraction. (D) Fluoroscopic view of incomplete occlusion of left pulmonary artery with embolized vegetation after the procedure. ICE, intracardiac echocardiography; RA, right atrium.

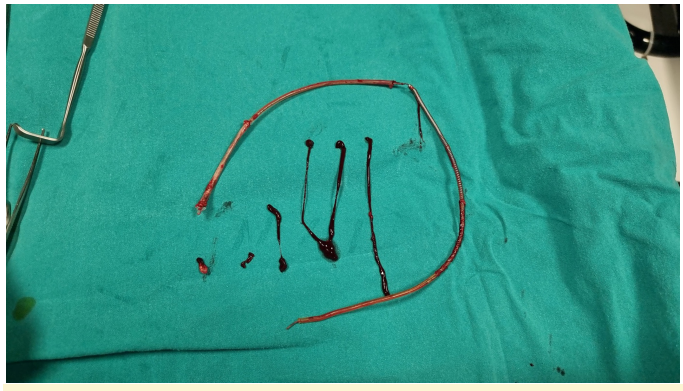

Figure 3. Demonstration of extracted materials including lead and vegetation.

Discussion

Infection of CIEDs is a severe disease associated with high mortality.[1] The CIED infections occur via 2 major mechanisms. The most common is the contamination of leads and/or pulse generator during implantation or subsequent manipulation[3] and the second one is a bloodstream infection.[4] Currently, the main treatment strategy for ICD infections is the complete removal of the device (generator and leads) and prolonged antibiotic therapy.[5] Nevertheless, some authors recommend surgery in patients with very large vegetation, especially >2 cm in diameter owing to huge material embolization to the pulmonary artery.[6] In this case, the patient had a giant vegetation (3.6 × 0.8 cm), because of the patient who was treatment nonadherence and early termination of treatment during his first hospitalization. Hemodynamic instability, multi-organ failure, huge vegetation over the lead, and sparing of the tricuspid valve from the infection were the main determinants to decide the percutaneous debulking strategy for us. In previous case reports, this strategy was applied to patients with the same condition.[6] But, vacuum-assisted systems such as AngioVac (AngioDynamics, Latham, NY, USA) were used for all of these kinds of case reports. Previously, very few cases were published by using a snare for vegetectomy after lead removal and removal of vegetation suspected mass over the lead.[7,8] Successfully, vegetation was removed by snare under real-time TEE monitoring. They recommended that especially pedunculated morphology of vegetation is suitable for snare technique rather than sessile. In addition to the clinic and echocardiographic parameters of the patient that was mentioned earlier, the pedunculated morphology of vegetation encouraged us for the removal of vegetation percutaneously. Unfortunately, we did not have AngioVac system in our center and decided to perform percutaneous approach by using snare for removal of vegetation under direct visualization of ICE. The main reason that increased our motivation for snaring was the small width of the vegetation, for snaring was small width of the vegetation, 8 mm, was derived from TEE image and used large internal diameter steerable sheath and real time visualization of procedure by ICE to increase our success. Intracardiac echocardiography and fluoroscopy imaging was very helpful for us.

There was residual vegetation that was seen in the ICE image after the removal of some material, unlike vacuum-assisted systems. Residue vegetation embolized to the left pulmonary artery which caused near-total occlusion after the removal of lead. This is contrary to the previous vacuum-assisted system that removed almost all vegetation material. In this case, our aim was not the complete removal of vegetation, which we were aware of. The purpose was solely to reduce the size of the vegetation, particularly to a size below 2 cm, and prevent the embolization of large material into the pulmonary artery. We eventually succeeded in achieving this goal. The patient was extubated early and discharged after 6 weeks.

Conclusion

Large CIED lead vegetation, >2 cm, could be managed by debulking of vegetation by percutaneous approach. Vacuum-assisted systems are the first-line percutaneous approach for it, because of the nearly complete removal of vegetation. But, percutaneous snaring method could be used with real-time visualization of procedure by ICE, to reduce size of vegetation that is main purpose, especially in patients with sparing of tricuspid valve from the infection.

Informed Consent: Written informed consent was obtained from the patient.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – T.G., Y.K.; Design – T.G., Y.K.; Supervision – T.G., U.S.; Materials – T.G.; Data Collection and/or Processing – T.G., U.S., Y.K.; Analysis and/or Interpretation – T.G.; Literature Review – U.S.; Writing – T.G.; Critical Review – T.G., U.S., Y.K.

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Video 1: Vegetation over the lead and 3D imaging of vegetation.

Video 2: Debulking of vegetation by microsnare under real time visualization of ICE.

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