






Intracranial Abscess Due to Septic Embolism in a Patient with Left Ventricular Assist Device

Sol Ventrikül Destek Cihazı Olan Bir Hastada Septik Emboliye Bağlı İntrakraniyal Apse

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ABSTRACT The left ventricular assist devices (LVAD) are increasingly getting used as an alternative option of heart transplantation in patients with advanced heart failure. However, it is associated device-related complications such as thromboembolism, infection and cerebrovascular accident. We report a patient with intracranial abscess and hemorrhage caused by driveline infection, who underwent LVAD implantation previously. In this report, we show that a driveline infection may predispose major complications after discontinuation of antibiotics even with successful treatment.

Keywords: Staphylococcal infections; heart-assist devices; cerebral hemorrhage

ÖZET İleri kalp yetmezliği olan hastalarda sol ventrikül destek cihazları (LVAD), kalp nakline alternatif olarak kullanılmaktadır. Bununla birlikte, tromboembolizm, enfeksiyon ve serebrovasküler kaza gibi cihazla ilişkili komplikasyonlar söz konusudur. Bu olgu sunumunda, LVAD implantasyonu öyküsü olan, driveline enfeksiyonu nedeniyle intrakraniyal abse ve hemoraji gelişen bir hastayı sunmaktayız. Bu yazıda, driveline enfeksiyonunun başarılı bir tedavi ile bile, antibiyotik tedavisine son verildikten sonra majör komplikasyonlara yol açabileceğini gösterdik.

Anahtar Kelimeler: Stafilokokal enfeksiyonlar; kalp destek cihazları; serebral hemoraji

Heart failure is getting one of the most common causes of death in developed nations and the demand for donor hearts far exceeds the supply makes left ventricular assist devices (LVAD) an alternative choice for many patients with advanced heart failure. LVADs provide mechanical circulatory support in patients with heart failure for bridge to recovery, bridge to transplantation or a destination therapy.¹

Despite advances in device technology, the use of LVADs is associated with significant risk of device complications including thromboembolism, infection, device failure and cerebrovascular accidents (CVA).² LVAD-related (the surgical site, the driveline, the device pocket or the pump itself) infections carry a major risk of morbidity and mortality, and generally occurs in 25-50% of all cases. The driveline is frequently implicated as the initial source of these infections and the infection in this site may spread to multiple sites such as pump pocket or blood stream.³ Blood stream infection is associated increased with the risk of cerebrovascular accident and is an independent predictor of hemorrhagic CVA.⁴

We present a case with LVAD who developed an intracranial abscess and hemorrhage due to a device-related infection and septic embolization 17 months after LVAD implantation.

CASE REPORT

A 47-year-old woman who underwent LVAD implantation (HeartAssist-5, MicroMed Cardiovascular, Inc., Houston, TX, USA) due to the dilated cardiomyopathy for bridge to transplantation 14 months ago, presented with subfebrile fever, purulent drainage and erythema surrounding the exit site of driveline but with no any cardiac symptoms. A culture of the drainage grew methicillin sensitive *Staphylococcus aureus*, but negative blood culture was obtained. International normalized ratio (INR) was at the therapeutic range and parameters suggesting systemic infection were normal.

A soft tissue ultrasound scan was performed to evaluate whether the presence of infiltrative changes surrounding the driveline, but it showed no infiltrative changes. Transthoracic echocardiography (TTE) revealed no signs for thrombus or vegetation in mitral and aortic valves, inflow and outflow canulas of LVAD (Figure 1). Moreover, doppler interrogation showed no elevated velocities across the conduit indicating device thrombosis. Computed tomography (CT) scan revealed no signs for pump pocket infection (Figure 2A), pump thrombosis (Figure 2B) and infiltrative changes surrounding the driveline at the mediastinum entry (Figure 2C). The patient was treated with daptomycin for 2 weeks. The culture of the drainage obtained at

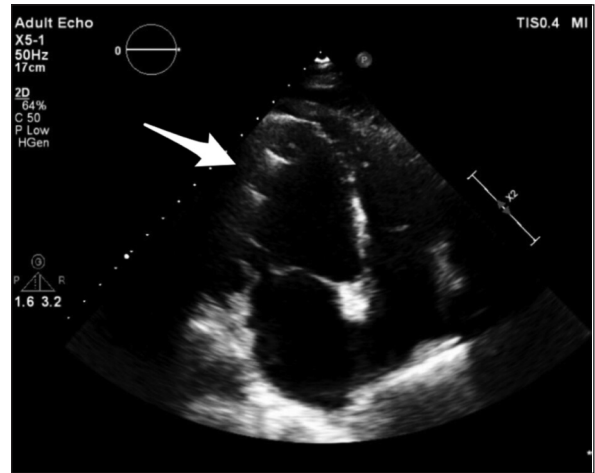


FIGURE 1: 2D imaging in the four-chamber view focused on the inflow cannula of LVAD (arrow). It revealed no sign for thrombus or infection at the mitral leaflets and inflow cannula.

the end of the antibiotic treatment grew normal skin flora. After clinical improvement, the patient was discharged and followed-up with outpatient clinic visit uneventfully.

Approximately 3 months after discontinuation of antibiotics, the patient presented with an alteration on her mental status, left hemiparesis and fever. An immediate CT scan revealed findings consistent with intracranial abscess and hemorrhage in the parieto-occipital lobe (Figure 3A). After withholding of aspirin and warfarin therapy and the immediate reversal of anticoagulation, the patient underwent operative intervention; craniotomy for abscess and clot evacuation. Despite of administration of platelet, fresh frozen plasma transfusions and coagulation factors, a follow-up CT scan sho-

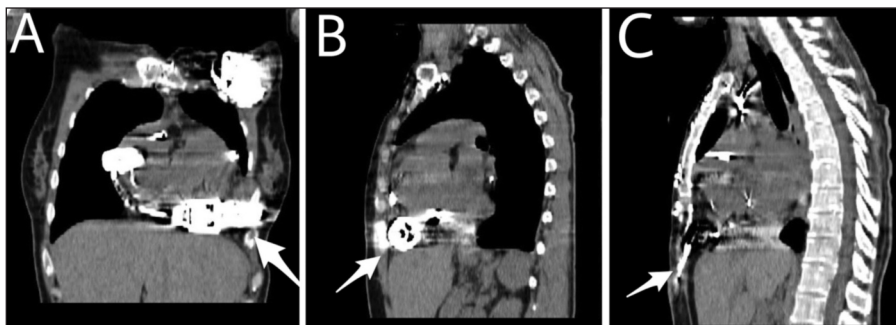


FIGURE 2: CT scan showed no signs of infectious infiltration in pump pocket (A), thrombus formation in LVAD (B) and infiltrative changes surrounding driveline at the mediastinum entry (C).

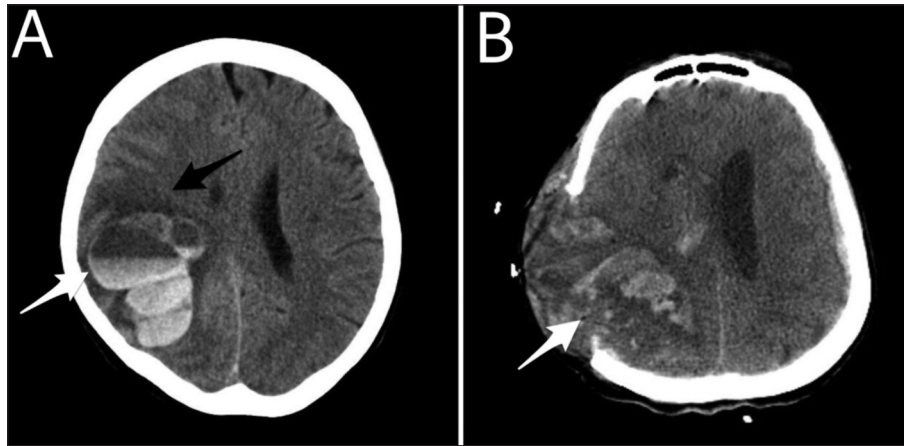


FIGURE 3: Preoperative CT scan revealed an intracranial abscess (white arrow) and hemorrhage (black arrow) (A) intracerebral hemorrhagic expansion is shown after craniotomy (B).

wed that the parieto-occipital hemorrhage increased (Figure 3B). The patient was deemed neurologically unsalvageable and died on the first postoperative day. The post-mortem examination of the pump was unremarkable, but the same organism cultured from the driveline exit site was also found at both the ventricular assist device and intracranial abscess. A patient consent form was obtained to share aforementioned details.

DISCUSSION

The LVAD is getting a commonly preferred and obligatory option in patients with advanced heart failure until myocardial recovery occurs or a donor heart becomes available. The use of LVADs improve the quality of life and reduce mortality in these patients by providing mechanical circulatory support. The lack of balance between demand and supply of donor hearts makes LVAD an alternative and standard option as destination therapy for patients who has no opportunity for transplantation. For these reasons, many heart centers favor the LVADs as a destination therapy instead of cardiac transplantation.⁴ There are three indications for ventricular assist devices; bridge to recovery, bridge to transplantation, and destination therapy.¹

The need for ventricular assist devices for patients awaiting heart transplantation encourages the development of LVAD technology. Despite advances in device technology, the use of LVADs

often results in device-related complications such as hemorrhage, thromboembolism, arrhythmias, malposition of inflow or outflow cannulas, infection and CVA.^{2,5} The frequency of complications varies considerably with device-type and patient-related factors. LVAD infection is a major reason of morbidity and mortality, and occurs in 25-50% of patients. The period between 2 weeks and 2 months of implantation is the most risky time for device-related infections.³

Despite driveline infection is the most common device-related infection, it may be managed with only wound care and antibiotics. But, relapse is common and the infection may spread to sites with high risk of mortality; pump pocket or blood stream. Moreover, the driveline is frequently implicated as the initial source of these infections. Gomez et al. reported that patients with infiltrative change size around the driveline of ≥ 14 mm are more prone to develop pump or mediastinal abscesses.⁶ Pathogens such as *Staphylococcus aureus* may have the capacity to bind directly to the device surface and lead LVAD-related endocarditis or thromboembolic complications. In addition, Kato et al. demonstrated LVAD infection to be an independent risk factor for CVA and Aggarwal et al. advocated that blood stream infection increases the risk of CVA and is an independent predictor of hemorrhagic CVA.^{4,7}

In the current case, LVAD infection occurred as a driveline infection 14 months after implanta-

tion of device. Treatment was achieved with solely wound care and appropriate antibiotics. In three months after discontinuation of antibiotic therapy, despite lack of any symptom about driveline infection, it is clear that infection spread to blood stream. Immediate craniotomy was performed in the patient who is presented with large intracranial abscess and hemorrhage. However, the operative intervention did not alter the risk of death, as reported by Wilson et al.⁸

In conclusion, the lack of balance between demand and supply of donor hearts, advances in device technology and increasing experience have resulted LVAD becoming the most preferred option in treatment of patients with advanced heart failure. The increased use of LVADs makes follow-up of device-related complications critical. The driveline infection may lead to complications with high risk of mortality such as intracranial abscess as reported in this article. The necessity of continuous antibiotic therapy should be clarified in pa-

tients with history of driveline infections even if disappearance of drainage from the exit site.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Serdar Akansel, Murat Sargin; **Design:** Serdar Akansel, Sevinç Bayer Erdoğan; **Control/Supervision:** Serap Aykut Aka; **Literature Review:** Özlem Yıldırım Türk; **Writing the Article:** Serdar Akansel; **Critical Review:** Murat Sargin, Serap Aykut Aka.

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