

Very Late and Subacute Right Ventricular Lead Perforation Presenting as Cardiac Tamponade

Kardiyak Tamponad ile Başvuran Çok Geç ve Subakut Sağ Ventriküler Lead Perforasyonu

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ABSTRACT

Ventricular lead perforation (VLP) is a rare and life-threatening complication of permanent pacemakers. Generally, VLP emerges in acute and subacute periods after cardiac electronic devices are implanted. Late VLP is unexpected and occurs less frequently. There is an uncertain approach to the treatment of VLPs. Collaboration with cardiovascular surgeons is recommended. Herein, we present two cases of cardiac perforations who were successfully managed. One of them was admitted with cardiac tamponade four years after dual-chamber pacemaker (DCP) implantation, and the right ventricular lead was successfully removed with an open surgical method. The other was admitted with cardiac tamponade two weeks after DCP implantation. Ventricular lead was extracted by a simple traction method without surgical support and successfully re-implanted in the correct location.

Keywords: Pacemaker, cardiac perforation, cardiac tamponade

ÖZ

Ventriküler lead perforasyonu (VLP), kalıcı kalp pillerinin nadir görülen ve hayatı tehdit eden bir komplikasyonudur. Genellikle VLP, kardiyak elektronik cihazlar implante edildikten sonra akut ve subakut dönemlerde ortaya çıkar. Geç VLP alışılmadık bir durumdur ve daha az sıklıkla meydana gelir. VLP'lerin tedavisine yönelik belirsiz bir yaklaşım vardır. Kardiyovasküler cerrahlarla işbirliği önerilir. Burada başarıyla tedavi edilen iki kardiyak perforasyon vakasını sunuyoruz. Bunlardan biri çift odacıklı kalp pili (DCP) implantasyonundan dört yıl sonra kalp tamponadı ile başvurdu ve sağ ventrikül lead'i açık cerrahi yöntemle başarıyla çıkarıldı. Diğer, DCP implantasyonundan iki hafta sonra kardiyak tamponad ile kabul edildi. Ventriküler lead, cerrahi destek olmaksızın basit bir traksiyon yöntemiyle çıkarıldı ve doğru yere başarıyla yeniden implante edildi.

Anahtar kelimeler: Pacemaker, kardiyak perforasyon, kardiyak tamponad

Received: 09.03.2021 Accepted: 13.05.2021 Published (Online):31.12.2021

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To cited: Gocer K, Yıldırım Hİ. Very Late and Subacute Right Ventricular Lead Perforation Presenting as Cardiac Tamponade. Acta Med Alanya 2021;5(3):326-329 doi:10.30565/medalanya.893608

INTRODUCTION

Ventricular lead perforation (VLP) is a rare and severe complication encountered after permanent pacemaker implantation. Frequently, VLP provides symptoms in the early postoperative period. Late VLP is unusual. Patients may present with the asymptomatic or life-threatening condition of cardiac tamponade. [1] Management and treatment of VLP are controversial. Decisions by councils, which consists of cardiovascular surgeons and cardiologists, are essential for the management of ventricular perforations. [2]

We present two cases of cardiac perforation, which emerged four years and two weeks, respectively, after cardiac implantable electronic device (CIED) was inserted.

Case 1

An 81-year-old male patient was admitted to our clinic with shortness of breath. Electrocardiogram (ECG) showed complete heart block (CHB). He had a dual-chamber pacemaker (DCP) implanted in 2016 due to CHB (5076 capsurefix novus ventricular lead (VL), 5594 CapSure SP Novus atrial lead, values of origin VL were 659 ohms, sensing 8 V and threshold 1 V). Massive pericardial effusion and cardiac tamponade were evident in the echocardiography. Emergency percutaneous pericardial drainage was performed because of hemodynamic instability. Pericardial effusion had hemorrhagic character, and 700 ml effusion was drained. Additionally, the tip of the right VL was observed outside the ventricle on echocardiography (Figure 1A). A temporary pacemaker was implanted in the catheter laboratory. After hemodynamic stabilization, the patient underwent computed tomography (CT) assessment. The right VL tip was outside on CT (Figure 1B). Pace control revealed that the pacemaker was end of life, and the right VL was not pacing. When control records of the patient were examined, impedance and sensing values of the right VL were average at device interrogation one year previously. The remaining battery time was about three years. Extraction of VL was decided by open surgery because the patient was admitted with clinical findings of cardiac tamponade four years after CIED. Median sternotomy was performed in the hybrid operating room, and we

successfully removed VL by a simple traction method. The ventricular perforation area was repaired with simple suturing (Figure 1C). Then, a new right VL and battery were placed in the same session. The patient was discharged uneventfully five days after the operation.

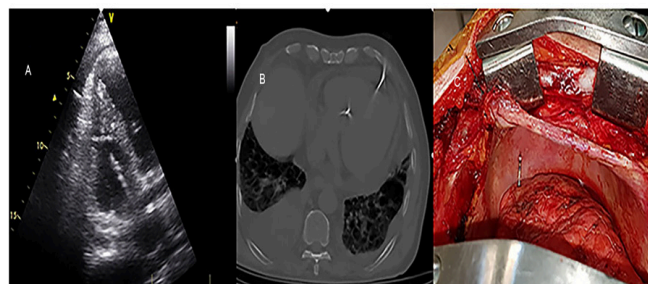


Figure 1. A. Ventricular lead tip outside of the right ventricular cavity on echocardiographic assessment. B. Chest computed tomography depicting lead perforation. C. Surgical view showing the perforating lead

Case 2

A 60-year-old female patient was admitted to the emergency service with complaints of shortness of breath and dizziness. DCP (Tendril 5088-58 VL, Tendril 5058-52 atrial lead) was implanted two weeks previously. ECG showed low voltage. Cardiac tamponade was identified on echocardiography, and VLP was observed on thorax CT (figure 2). Intracardiac records show that right ventricle (RV) impedance was higher than onset impedance values, and RV threshold had minimally increased (RV impedance 1004 ohms, origin impedance 759 ohms, RV threshold 3V, origin threshold 0.8 V). Emergency pericardial drainage was performed. Pacemaker lead revision was performed by the simple traction method, and the same lead was implanted in the proper localization under surgeon observation. She was discharged uneventfully three days after the lead revision.



Figure 2. A. Chest X-ray depicting right ventricular lead outside the cardiac border B. Thorax CT showing right ventricular lead perforation C. Angiographic image demonstrating right ventricle lead tip outside the cardiac silhouette

DISCUSSION

Various complications can occur in the early and late periods after implanting permanent pacemakers. Among the complications, local hemorrhage, inflammation in the pulse generator pocket, hemothorax, pneumothorax, cardiac perforations, atrial and ventricular lead dislodgment can be listed. These complications are diagnosed by radiological imaging methods (chest x-ray and CT), echocardiography, and any programmable output (failure to capture or sense or both). Treatment of complications generally requires invasive re-operation and a multidisciplinary approach by surgeons. [1]

Ventricular lead perforations are life-threatening complications. Generally, VLPs are diagnosed in acute and subacute periods. Most patients are admitted with shortness of breath and stabbing chest pain. Tamponade and severe pericardial effusion are observed less than expected. Perforation of the liver lobe, chest muscle twitching, hiccups, and chest wall hematoma due to the migration of the lead were rarely reported in previous studies. When the lead migrates out of the cardiac silhouette, echocardiography, fluoroscopy, and chest radiography can detect the problem. Sometimes cardiac perforation may develop after many years without any symptoms. Late lead perforations are very rare in the literature. [3] Cano et al. reported that cardiac perforation was detected in 17 (13 acute and 4 subacute perforations) (0.8%) of 3822 active pacemaker patients. Thirteen patients had pericardiocentesis performed and late VLP was not observed in this study. Female gender, apically localized lead, and age over 80 years were risk factors for VLP. [4]

Active ventricular fixation leads are usually used in CIED. Active fixation leads are responsible for cardiac perforations. Sterlinski et al. compared actively and passively fixated VLPs with active fixation performed in 1,200 patients and passive fixation in 1047 patients. Cardiac perforation occurred in eight patients. All of them were associated with active fixation lead implantation. [5] Helical screw active fixation was used in our two cases. The second case presented with cardiac tamponade in the early period. The tip of the lead was outside of the heart on imaging so

we can understand why symptoms emerged in the subacute period. The first case did not have any symptoms for a long time, neither during pacemaker checks nor on imaging. The screw of the lead likely passed into the pericardium, not the whole lead tip. Each ventricular contraction may cause the progression of the lead and deteriorate the myocardium. This can explain causing cardiac tamponade for an extended period.

There are few cases of late VLP in the literature. Ventricular leads which were implanted for more than one year can be removed by the transvenous lead extraction method or surgical method. Surgical removal is infrequent. Surgical removal is performed when there are concomitant conditions such as cardiac tamponade, tricuspid valve endocarditis, or valve stenosis and undergoing coronary artery bypass graft. [6] We decided to surgically remove VL due to the possibility of active bleeding related to long implantation time and defect of the ventricle in the first patient. Median sternotomy was performed to repair the bleeding focus and exclude causes of hemorrhagic effusion in our first case. In a study consisting of 14 patients, lead extraction was performed using minimal surgical procedures. A minimally invasive method was performed due to infective endocarditis and lead malposition. [7] Cardiac perforation and tamponade were not stated in this study. The second case presented with cardiac tamponade in the subacute period. But this patient didn't undergo a surgical operation. Hitochi et al. retrospectively studied 1359 patients with CIED. Fifteen patients had VLP in the early period. The ventricular lead was withdrawn and re-implanted in 14 patients without a surgical method. [2] No complications were observed. VL extractions without surgical techniques are uncommon in patients who present with cardiac tamponade. The transvenous extraction method was successfully performed, and ventricular lead was re-implanted in our second case without any complications during 6 months of follow-up. It is likely the reason was low right pressure, myocardial contraction, and covering perforation with fibrosis.

CONCLUSION

Management of VLP is complicated and difficult. Extraction of right VL by the surgical method

may be appropriate in terms of complications, but VL which is responsible for perforation can be extracted by the simple traction method under X-ray in acute and subacute VLP. We rarely encounter VLP causing cardiac tamponade even after many years. The RV can be repaired by the surgical method due to bleeding risk.

Conflict of Interest: The author declares no conflict of interest related to this article.

Funding sources: The author declares that this study has received no financial support.

Peer-review: Externally and internally peer reviewed.

REFERENCES

1. Ellenbogen KA, Hellkamp AS, Wilkoff BL, Camunãs JL, Love JC, Hadjis TA, et al. Complications arising after implantation of DDD pacemakers: the MOST experience. *Am J Cardiol.* 2003;92(6):740-1. doi: 10.1016/s0002-9149(03)00844-0.
2. Mori H, Kato R, Ikeda Y, Tsutsui K, Saki H, Sayaka T, et al. Percutaneous Simple Lead Traction Is a Feasible and Effective Method for Right Ventricular Lead Perforations. *Int Heart J.* 2020;61(1):54-9. doi: 10.1536/ihj.19-326.
3. Akbarzadeh MA, Mollazadeh R, Sefidbakht S, Shahrzad S, Bahrololoumi Bafruee N. Identification and management of right ventricular perforation using pacemaker and cardioverter-defibrillator leads: A case series and mini review. *J Arrhythm.* 2017;33(1):1-5. doi:10.1016/j.joa.2016.05.005.
4. Cano O, Andres A, Alonso P, Osca J, Tello MJS, Olagüe J, et al. Incidence and predictors of clinically relevant cardiac perforation associated with systematic implantation of active-fixation pacing and defibrillation leads: a single-centre experience with over 3800 implanted leads. *Europace.* 2017;19(1):96-102. doi: 10.1093/europace/euv410.
5. Sterliński M, Przybylski A, Maciąg A, Syska P, Pytkowski M, Lewandowski M, et al. Subacute cardiac perforations associated with active fixation leads. *Europace.* 2009;11(2):206-12. doi: 10.1093/europace/eun363.
6. Danik SB, Mansour M, Singh J, Reddy VY, Ellinor PT, Milan D et al. Increased incidence of subacute lead perforation noted with one implantable cardioverter-defibrillator. *Heart Rhythm.* 2007;4(4):439-42. doi:10.1016/j.hrthm.2006.12.044.
7. Azarrafy R, Carrillo RG. Surgical and Hybrid Lead Extraction. *Card Electrophysiol Clin.* 2018;10(4):659-65. doi: 10.1016/j.ccep.2018.07.006.

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