Cardiac infiltration of diffuse large B-cell lymphoma manifesting as sustained ventricular tachycardia: a case report.

Dening Liao¹, Wei Chen², Kun Huang¹, Weiwei Guo², Fan Zhou², and Jacob N. BlackwellMD³

¹Shanghai Changzheng Hospital
²Shanghai Jing’an District Zhabei Central Hospital
³Wake Forest University School of Medicine

May 8, 2023

Abstract

We present a 77-year-old man suffer from suspected cardiac infiltration of diffuse large B-cell lymphoma manifesting as sustained ventricular tachycardia. Neither antiarrhythmic drugs nor defibrillation can terminate VT episodes. the ECG showed sustained wide QRS tachycardia with left bundle branch block (LBBB) morphology and QRS complex positive in lead I and aVL, which inferred the tachy-arrhythmia would originated from the anterior wall of the right ventricle, this was consistent with the exact location of the tracer high-uptake on prior PET-CT. Chemotherapy was started urgently, the electrical-storm was eliminated within 48 hours and did not recur during three months of follow up. We will discuss the clinical presentation, diagnostic procedure, treatment and some reflections.

Introduction:

Cardiac tumors are rare. Cardiac metastases occur in up to 10% of patients with cancer. Among cardiac neoplasms, metastases are far more common than primary cardiac tumors[1]. Metastatic cardiac neoplasms most frequently metastasize from the respiratory system, followed by the hematopoietic system, according to a 30-year analysis of cardiac neoplasms at autopsy[2]. Of patients with evidence of cardiac involvement from hematopoietic system, diffuse large B-cell lymphoma (DLBCL) was the most frequent non-Hodgkin’s lymphoma (NHL) subtype[3]. The symptoms of cardiac metastases vary depending on the degree of myocardial infiltration. Arrhythmias, such as atrioventricular block, atrial flutter or fibrillation, ectopy, or ventricular tachycardia, can be present, especially when the conduction system has been infiltrated[4]. We report a DLBCL case with localized infiltration of the right ventricular myocardium and LBBB morphology ventricular tachycardia.

Case presentation

A 77-year-old man presented to the emergency department with a cough and low-grade fever. Electrocardiogram (ECG) compared to six months before, showed a right bundle branch block (RBBB) and ST-segment elevation in the leads of V1-V3. Coronary angiography excluded coronary ischemia. Cardiac ultrasound, as well as cardiac 3.0T MRI revealed no significant cardiac mass. Chest CT revealed multiple site lymphadenopathy in the mediastinum, and further PET-CT examination found that multiple lymph nodes of different sizes above the mediastinum had different degrees of elevated glucose metabolism (bilateral neck, bilateral axillary, mediastinum, double hilar and left diaphragm angle, superficial and relatively large lymph node lesions were located deep under the right side of the mandibular, size about 1.2cm, SUVmax=23.7). Glucose metabolism increased unevenly in cardiac ventricles, especially the anterior wall of the right ventricle
(SUVmax=7.1), which led to the clinic diagnosis of lymphoma (Figure 1). Biopsy of the right submandibular lymph node was performed, and the pathology reported Non-Germinel Center/Activated B-Cell Type Diffuse Large B-Cell Lymphoma (non-GCB/ABC DLBCL) (Figure 2). Ten days after the confirmation of DLBCL diagnosis by pathology, the patient suffered from sustained a wide QRS complex tachycardia with a heart rate of 200 beats per minute (Figure 3). From the QRS complex of LBBB morphology and positive in lead I and aVL, we inferred the tachy-arrhythmia should be originating from the anterior wall of the right ventricle, this was consistent with the elevated tracer uptake myocardium detected by PET-CT. Intravenous injection of 150mg amiodarone followed by 1mg/min continuous intravenous infusion was administered and the patient deteriorated to electrical storm with frequent episodes of VT. His hemodynamics worsened. After administration of lidocaine (50mg by intravenous injection, 2mg/min continuous intravenous infusion), the frequency of VT episodes was significantly reduced but with frequent ventricular premature. At that time, we considered that the VT would be related the cardiac infiltration of lymphoma.

Urgently, the patient underwent three rounds of induction chemotherapy guided by a hematologist utilizing strategies based on R-CHOP (rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone) regimen. The electrical-storm and ventricular premature was eliminated within 48 hours and did not recur during three months of follow up despite persistence of RBBB still on ECG. Three months post chemotherapy, PET-CT imaging revealed near-complete disappearance of the previous high-uptake lesion and a significant reduction in myocardial uptake irregularities when compared to prior scans (Figure 1).

Discussion

Although rare, there are several cases of cardiac involvement by lymphoma reported [8-11]. Most of these cases involved cardiac occupation that was evident through multimodal imaging including ultrasound and cardiac MRI. We observed a DLBCL patient with electrical storm, without obvious cardiac masses detected by ultrasound or cardiac MRI. Although myocardial biopsy was not performed and there was no direct evidence of pathology, we infer it could be related to lymphoma cardiac infiltration based on the following reasons: 1. The QRS complex of VT had an LBBB morphology and was positive in lead I and aVL, which was consistent with the exact location of the tracer high-uptake in the right ventricular myocardium by PET-CT. 2. The electrical storm and ventricular premature beats were eliminated within 48 hours after chemotherapy and did not recur during the three months of follow-up, which suggests that the VT was responsive to chemotherapy. 3. PET-CT at 3 months post-chemotherapy revealed that the tracer high-uptake in the right ventricular myocardium decreased dramatically. 4. The presence of new RBBB and elevated troponin before the VT episode could reasonably be attributed to lymphoma involvement.

The incidence of cardiac involvement in lymphoma is infrequent, affecting only 10-25% of autopsy cases [5]. The heart can be invaded by tumors through hematogenous and lymphatic spread, transvenous extension, and direct extension [6]. Hematogenous and lymphatic metastasis may cause myocardial infiltration. Our case noticed that the infiltration of progressive lymphoma into the cardiac myocardium may not be detected by cardiac ultrasound or MRI, but it may cause malignant arrhythmias and be detected by PET-CT.

DLBCL is the most prevalent subtype of non-Hodgkin lymphoma. The standard treatment for DLBCL worldwide is the R-CHOP regimen, which consists of cyclophosphamide, doxorubicin, vincristine, prednisone, and rituximab administered every three weeks[7]. In patients afflicted with advanced malignancies and malignant arrhythmias, particularly lymphoma, if antiarrhythmic medications and electronic cardioversions are not effective for the management of arrhythmias, cardiac infiltration should be taken into account as a possible cause of arrhythmias. PET-CT and anti-tumor interventions warrant consideration as a viable approach to detecting and mitigating arrhythmic episodes.

References


Figure legend.

![Figure 1: Positron-emission tomography computed tomography (PET-CT) scan. (A) Myocardial tracer uptake elevated in all cardiac ventricular chambers, especially the right ventricle (SUVmax=7.1) before chemotherapy. (B) Near-complete disappearance of the previous high-uptake lesion and a significant reduction in myocardial uptake irregularities after chemotherapy.](image)

![Figure 2: Histological confirmation of a non-GCB/ABC DLBCL. (A) Right submandibular lymph node](image)
biopsy: haematoxylin–eosin stain. (B-D) Right submandibular lymph node biopsy: Immunohistochemical staining of CD20(B), BCL-6(C),CD19(D), Ki-67(E), MUM-1(F).

Figure 3: Twelve-lead electrocardiogram (25mm/s) showing wide QRS complex tachycardia with LBBB morphology and QRS complex positive in lead I and aVL, which inferred that the VT was originated from the anterior wall of the right ventricle.