Journal of Clinical and Experimental Cardiology

Jayaraj and Ganesan, J Clin Exp Cardiolog 2018, 9:2
DOI: 10.4172/2155-9880.1000571

Case Report Open Access

Differential Diagnosis of Transient Left Ventricular Dysfunction in a Critically Ill Patient

Ashok Kumar Jayaraj[1*] **and Sundar Kumar Kadarayandi Ganesan**[2]

[1]*Department of Anesthesia and Pain Management, Mount Sinai Hospital, University of Toronto, Toronto, Canada*

[2]*Department of Cardiology, International Modern Hospital, Dubai, UAE*

[*]**Corresponding author:** Ashok Kumar Jayaraj, Anesthesia Fellow (Canada), Department of Anesthesia and Pain Management, Mount Sinai Hospital, 600 University Ave, Toronto, ON M5G 1X5, Canada, E-mail: ashokkumarkarthik1@gmail.com

Received date: January 29, 2018; **Accepted date:** February 09, 2018; **Published date:** February 12, 2018

Abstract

There is evidence illustrating that the etiologies of non-ischemic LV (left ventricular) dysfunction such as Takotsubo cardiomyopathy, neurogenic stunning myocardium and post resuscitation stunning myocardium have a favorable clinical outcome. Good prognosis in non-ischemic LV dysfunction provides us courage to treat the condition expecting good. We describe herein the unique case of a 33-year-old woman who was started on combination chemotherapy of oxaliplatin and 5-flurouracil for colon adenocarcinoma. The patient's baseline QTc was 460 ms. Twenty-four hours following initiation of chemotherapy, the patient developed 3 discrete episodes of tonic-clonic seizures. Electrocardiogram assessment demonstrated a prolonged QTc interval (623 ms) with several episodes of TdP. Two episodes required defibrillation to revert to sinus rhythm. Post resuscitation echocardiogram showed severe global LV dysfunction with ejection fraction of 33%. The patient subsequently required mechanical ventilation due to severe LV dysfunction with pulmonary edema. Possible etiologies for LV dysfunction in the present case include global Takotsubo cardiomyopathy, neurogenic stunning myocardium or post resuscitation stunning myocardium. Repeat echocardiogram 48 h later showed the ejection fraction of 60%. Although myocardial dysfunction associated with Takotsubo cardiomyopathy, neurogenic stunning myocardium and post resuscitation stunning myocardium have been previously described independently, the present case is unique in that, to our knowledge, torsade de pointes presented with transient left ventricular dysfunction following several episodes of seizures and post resuscitation stunning myocardium that were stabilized in one patient following oxaliplatin and 5-fluorouracil infusion has not been reported.

Case Report

A 33-year-old female patient who underwent hemicolectomy for colon adenocarcinoma was admitted for chemotherapy. Her past medical history was unremarkable and notably, not significant for cardiovascular, respiratory or neurological disorders. She did not have intracranial metastasis. The patient was not on any medications that could affect the QT interval. Baseline blood investigations including electrolytes and renal parameters were within normal limits. The physical examination was unremarkable. Baseline electrocardiogram demonstrated normal sinus rhythm, normal PR interval and the Bazett-corrected QT interval was 460 ms. Echocardiogram showed normal size cardiac chambers, no regional wall motion abnormality and good LV systolic function, with ejection fraction of 67%.

Chemotherapy regimen was modified Folfox consisting of oxaliplatin 85 mg/m^2 intravenous on Day 1, 5-FU 400 mg/m^2 intravenous bolus on Day 1, followed by continuous infusion 1500 mg/m^2 for 22 h on Day 1 and 2. Leucovorin (folinic acid) 75 mg/m^2 was given as continuous infusion on Day 1 and 2.

Twenty-four hours after initiation of chemotherapy, the patient developed a seizure that was initially treated with intravenous diphenylhydantoin in the ward. Within a few minutes, she experienced two subsequent episodes of seizures and developed respiratory distress. Vital signs were as follows: blood pressure-80/50 mm hg; heart rate-95 beats/min; respiratory rate-25 breaths/min and SpO_2-88% on room air which improved to 92% with 8 L oxygen supplementation by face mask. Auscultation of chest revealed fine crackles in both lungs. She was immediately transferred to the intensive care unit (ICU). Due to worsening hemodynamic and respiratory function, the patient was intubated and connected to ventilator. Electrocardiogram showed markedly prolonged QTc (623 ms) with QRS widening, ST elevation in Lead II, III, aVF, V5, V6, Lead I and aVL and ST depression in V1, V2 and V3 (Figure 1). Chemotherapy was discontinued and magnesium infusion was promptly initiated. Serum electrolyte analysis demonstrated a potassium value of 2.2 Meq/L and potassium replacement was initiated accordingly. Arterial blood gas (ABG) showed severe metabolic acidosis. Cardiac enzymes, CK-MB and Troponin done 2 h, 12 h and 24 h after the insult were normal.

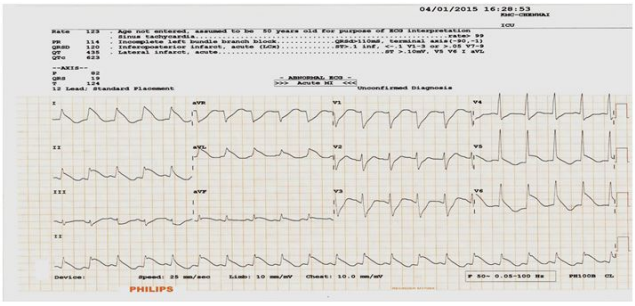

Figure 1: ECG Shows Long QT.

In the ICU, the patient had several episodes of TdP (Figure 2). Although some episodes resolved spontaneously, two episodes required defibrillation to revert to sinus rhythm. Echocardiogram showed global hypokinesia (Figure 3) with reduced LV ejection fraction to 33%. There was no regional wall motion abnormality such as apical ballooning. Dopamine infusion (10 $\mu gkg^{-1}min^{-1}$) was started. As after initial resuscitation, the heart rate stabilized. She was not treated with isoproterenol infusion or a temporary pacemaker. There were no additional seizures in intensive care unit. Magnesium and potassium infusions were continued. Serum electrolytes were normalized. Patient hemodynamically improved. Dopamine infusion was stopped. ECG 24 h later showed the QTc of 484 ms (Figure 4). Repeat echocardiogram (Figure 5) done after 48 h showed no wall motion abnormality and LV function returned to baseline (ejection fraction 60%)

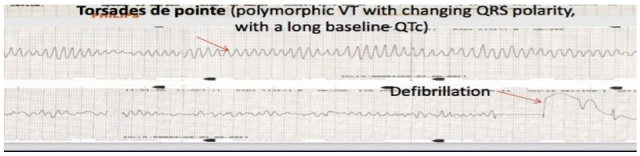

Figure 2: Torsades De Pointes (Polymorphic VT with changing QRS polarity) and ventricular fibrillation.

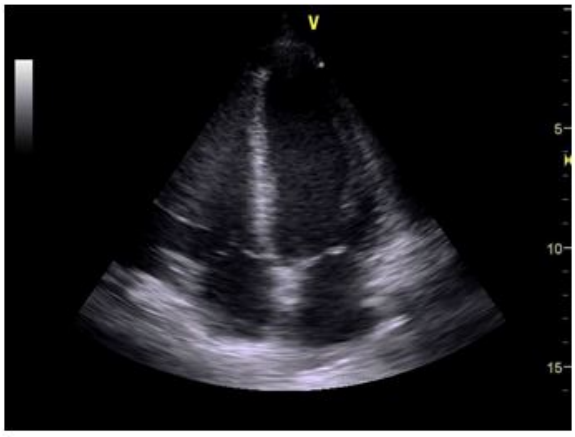

Figure 3: Severe left ventricular dysfunction.

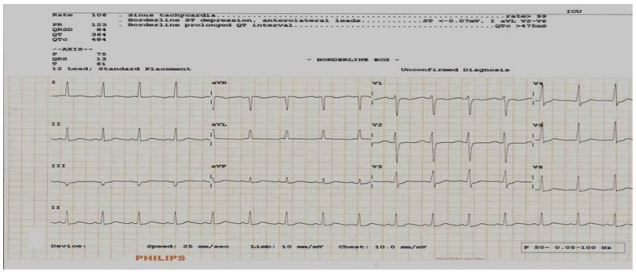

Figure 4: QTc and ST returned to baseline after 24 h.

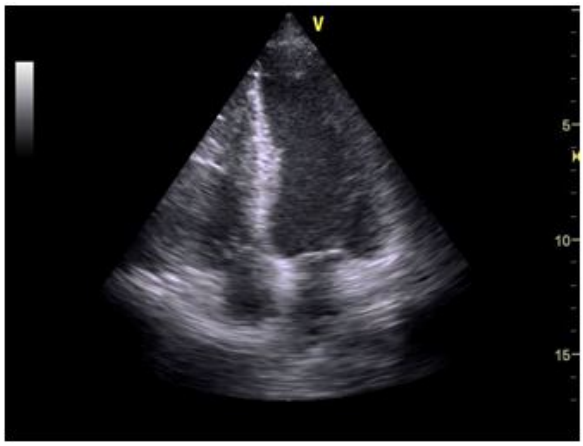

Figure 5: Normalization of left ventricular function.

Discussion

The long QT syndrome represents a variety of congenital and acquired disorders of ventricular repolarization characterized by a prolonged corrected QT interval (Bazett's formula: QTc=QT/√RR) on the electrocardiogram (Table 1) [1]. It is associated with a life threatening polymorphic ventricular tachycardia known as TdP. In the present case, the patient's QTc interval was 623 ms (163 ms higher than baseline). In rare instances, cardiac disease such as long QT syndrome induced TdP can present as seizure [2,3].

QTc prolongation (ms)	Men	Women
Normal	≤ 430	≤ 450
Borderline	431-450	451-470
Abnormal	>450	>470

Table 1: QTc prolongation into 3 gender-specific groups: normal; borderline; and abnormal.

Neurogenic stunned myocardium is defined as a sympathetically mediated myocardial injury or dysfunction after neurological insults in the absence of coronary artery disease [4]. Seizure is one of the causes of neurogenic stunning myocardium. For this patient, three episodes of seizures in short interval may likely have been the triggering factor for neurogenic stunning myocardium. Takotsubo cardiomyopathy is a condition characterized by a stress induced transient left ventricular dysfunction occurring in the absence of significant coronary artery disease. Though neurogenic stunning myocardium and Takotsubo cardiomyopathy share common features such as reversible LV dysfunction, in the present case, the patient presented with pulmonary edema and global hypokinesia, favoring the diagnosis of neurogenic stunning myocardium [5]. Based on previous reports in the literature, the most characteristic feature of neurogenic stunning myocardium is its complete reversibility and the restoration of normal myocardial function if the underlying acute neurological condition improves [6,7]. Fortunately, this patient's LV function returned to baseline in 48 h once the seizures were well controlled. Though transient global LV dysfunction favors the diagnosis of atypical global Takotsubo

cardiomyopathy, neurogenic stunning myocardium was considered as a primary cause of the transient LV dysfunction in this patient because the patient developed 3 discrete episodes of tonic-clonic seizures.

Post-resuscitation myocardial stunning is the mechanical dysfunction that persists after the restoration of spontaneous circulation. Several episodes of TdP requiring defibrillation in this patient can also be the direct cause for post resuscitation stunning myocardium which may have been the contributing factor for transient global LV dysfunction. Takotsubo cardiomyopathy, neurogenic stunning myocardium and post resuscitation stunning myocardium share common clinical features such as reversible LV dysfunction and good prognosis [6-8]. Moreover, they also share common pathophysiology, exaggerated sympathetic stimulation and elevated plasma catecholamines that may result in direct myocyte injury via an increase in intracellular calcium and oxygen-free radicals, diffuse coronary microvascular dysfunction, multivessel epicardial spasm, transient dynamic LV outflow tract obstruction, or direct injury to myocytes [9,10]. Taken together, it is undoubtedly challenging to distill the exact cause of the LV dysfunction based on clinical and investigation parameters alone. Further studies are warranted to better understanding of these three conditions.

Coronary vasospasm secondary to 5-FU is one of the rare, but life-threatening, forms of cardiotoxicity. ST changes in the patient favors the possibility of 5-FU induced myocardial dysfunction. Moreover, normal cardiac enzyme level does not rule out 5-FU induced coronary vasospasm [11]. 5-FU cardiotoxicity may be one of the contributing factors for LV dysfunction in our patient. It is difficult to rule out the possibility of 5-FU induced coronary vasospasm without coronary angiogram that was not warranted in our case. Though there was ST changes that favor the possibility of myocardial ischemia, no clinical or enzyme evidence of myocardial injury was noted. Moreover, the ST segment normalized within 60 min. Amiodarone was not considered for treatment of recurrent ventricular tachyarrhythmia as it causes further QTc prolongation and worsening of the clinical condition, especially with associated hypokalemia and hypomagnesemia [12].

Conclusion

In conclusion, our report supports evidence illustrating favorable prognosis in conditions such as Takotsubo cardiomyopathy, neurogenic stunning myocardium and post resuscitation stunning myocardium. Moreover, sharing common clinical features in these conditions indirectly implies the possibility of same pathophysiology. Good prognosis in non-ischemic LV dysfunction provides us courage to treat the condition expecting positive outcome.

References

1. Bazett HC (1997) An analysis of the time relations of the electrocardiogram. Ann Noninvasive Electrocardiol 2: 177-194.
2. Hunt DP, Tang K (2005) Long QT syndrome presenting as epileptic seizures in an adult. Emerg Med J 22: 600-601.
3. Lyon AR, Rees PS, Prasad S, Poole-Wilson PA, Harding SE (2008) Stress (Takotsubo) cardiomyopathy--a novel pathophysiological hypothesis to explain catecholamine-induced acute myocardial stunning. Nat Clin Pract Cardiovasc Med 5: 22-29.
4. Chin PS, Branch KR, Becker KJ (2005) Postictal neurogenic stunned myocardium. Neurology 64: 1977-1978.
5. Guglin M, Novotorova I (2011) Neurogenic stunned myocardium and Takotsubo cardiomyopathy are the same syndrome: a pooled analysis. Congest Heart Fail 17: 127-132.
6. Bybee KA, Prasad A (2008) Stress-related cardiomyopathy syndromes. Circulation 118: 397-409.
7. Nguyen H, Zaroff JG (2009) Neurogenic stunned myocardium. Curr Neurol Neurosci Rep 9: 486-491.
8. Kern KB, Hilwig RW, Rhee KH, Berg RA (1996) Myocardial dysfunction of resuscitation from cardiac arrest: an example of global myocardial stunning. J Am Coll Cardiol 28: 232-240.
9. Win CM, Pathak A, Guglin M (2011) Not Takotsubo: A Different Form of Stress-Induced Cardiomyopathy-A Case Series. Congest Heart Fail 17: 38-41.
10. Chalkias A, Xanthos T (2012) Pathophysiology and pathogenesis of post-resuscitation myocardial stunning. Heart Fail Rev 17: 117-128.
11. Atar A, Korkmaz ME, Ozin B (2010) Two cases of coronary vasospasm induced by 5-fluorouracil. Anatol J Cardiol 10: 461-462.
12. Nachimuthu S, Assar MD, Schussler JM (2012) Drug-induced QT interval prolongation: mechanisms and clinical management. Ther Adv Drug Saf 3: 241-253.