

Temporary Pacemaker induced Ventricular Fibrillation: An interesting case report

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Abstract

Temporary cardiac pacing involves electrical cardiac stimulation to treat a bradyarrhythmia or tachyarrhythmia until it resolves or until long-term therapy can be initiated. The purpose of temporary pacing is to re-establish circulatory integrity and normal hemodynamics that are acutely compromised by a slow or fast heart rate. In some situations, temporary pacing can be lifesaving. However, under sensing of QRS complex from ischemic area of ventricular cavity leads to inappropriate pacing spike on ST segment or on T wave of intrinsic complex, fall of pacing spike on this vulnerable period leads to induction of life threatening ventricular fibrillations. This phenomenon is known as “R on T phenomenon”. We report a case of

41 year old male, presented to us with ST segment elevated inferior wall myocardial infarction. On coronary angiography there was Double vessel disease with proximal right coronary artery (RCA) 100% cut off and left anterior descending artery (LAD) 60% stenosis. After coronary angiography and prior to angioplasty, temporary pacemaker inserted as patient was having bradycardia with heart rate of 36/min and after pacemaker insertion, he developed ventricular fibrillations (VF). Direct current (DC) shock was given and it was reverted to normal sinus rhythm, these VF episodes were reoccurring at frequent intervals. On analyzing electrocardiogram on monitor, it was thought that temporary pacemaker was the cause for this life threatening arrhythmia because of R on T phenomenon

and pacemaker was turned off. After that he didn't get any further episode of VF and successful percutaneous Tran's luminal coronary angioplasty (PTCA) of RCA with XIENCE Xpedition [2.75mm x 48mm] was performed.

Keywords: Temporary Pacemaker, Ventricular Fibrillations, R on T Phenomenon.

Introduction

Temporary pacing is a life-saving procedure and is a treatment of choice for bradyarrhythmias developed after myocardial infarction. Under sensing of QRS complex from the ischemic area of ventricular cavity leads to inappropriate pacing spike on ST-segment or T wave of intrinsic complex, and this fall of pacing spike on this vulnerable period leads to induction of VF which is life-threatening. This is known as the "R on T" phenomenon. The smirk in 1949 described the "R-on-T phenomenon" as "R waves interrupting T waves".^[1] The R-on-T phenomenon is a ventricular extrasystole caused by a ventricular depolarization superimposing on the previous beat's repolarization.^[2] There can be multiple causes of the R-on-T phenomenon in a patient with a pacemaker, one is pacemaker undersensing.^[3] The "R on T phenomenon" although uncommon, should be kept in mind if the patient developed VF/VT after inserting a temporary pacemaker in acute inferior wall Myocardial Infarction. The possible mechanism was under sensing of decreased strength intrinsic signals from the infarcted right ventricle, which leads to pacing stimulus to fall to T wave of the intrinsic QRS complex. Pacing spike on this vulnerable period leads to VF/VT. Here, we report a case of ventricular fibrillation that was caused by a temporary pacemaker in a coronary care unit.

Case Presentation

A 41y/Male presented in emergency with a history of chest pain and shortness of breath. The patient was a chronic smoker with no other co-morbidities as such.

On presentation vitals were:- Pulse Rate-40/min, Blood Pressure-90/60 mmhg, Respiratory Rate-32/min, SpO₂-96% on room air, Random Blood Sugar-143mg/dl, Glasgow Coma Scale-E4V5M6, and Juglar venous pressure was raised.

An ECG was done which was suggestive of ST-Elevation in leads II, III,aVF. Trop-T of the patient was positive. Loading dose (Ecosprin, Clopidogrel, and Atorvastatin) was given to the patient and the patient was shifted to Cath Lab for Primary PCI.

On coronary angiography there was Double vessel disease with proximal Right Coronary Artery- 100% cut off and Left Anterior Descending artery- 60% stenosis. After coronary angiography and before angioplasty, Given symptomatic bradycardia temporary pacemaker was inserted and the pacing lead was positioned in the right ventricle apex, with pacing at a rate of 60/minute and kept on Ventricle (sensed) Ventricle (paced) Inhibits (pacing output). (VVI) mode.

Immediately after pacing lead insertion patient became unstable and there were multiple episodes of ventricular fibrillation. Every episode was reverted to sinus rhythm for few seconds with DC shock but it reoccurred again. Then bolus dose of injection Metolar was given followed by multiple DC shocks every time, still, the rhythm was not reverted. Repeat ECG was done which was suggestive of 'R on T phenomenon'. It was noted that a pacing spike falls on the T wave of the normal intrinsic QRS complex which leads to these repeated episodes of VF. The pacemaker was turned off. After that no further episode of VF reoccurred and Heart Rate

was 50/min. Then successful PTCA of right coronary artery via right radial artery with XIENCE Xpedition [2.75mm x 48mm] was performed. The patient is then managed on Double antiplatelet, Statins, unfractionated heparin, and other supportive measures.

Discussion

Although R on T phenomenon described in this case is uncommon, recognizing this phenomenon is vital, as arrhythmia can be fatal and it is easy to treat. Though Constant ECG monitoring sometimes may not detect some episodes of pacemaker-induced VF in acute MI. Among most cases, Manipulation of pacing electrodes is the common cause of VF.^[4] Patients are also at risk for ventricular arrhythmias during removal of epicardial pacing wires.^[5] Other major complications of epicardial wires include infection, myocardial damage, perforation, tamponade, and disruption of coronary anastomoses.^[6] Therefore, it is important to consider the risks of using temporary epicardial pacing. The present case emphasizes the importance of early recognition of the R on T phenomenon and taking proper and quick measures to prevent morbidity and mortality. Similarly, McLeod AA et al. ^[4] reported 2 cases of pacemaker-induced VF in the coronary care unit. There occurred 15 episodes of VF and many sustained VT. Hence the pacemaker was turned off and patient was stabilised. Cueni TA et al. ^[7] Analyzed 35 consecutive acute myocardial infarction patients. They observed pacemaker-induced VT in 3 patients of inferior MI due to improper seeing. In most centers, Epicardial pacemaker wire insertion has been a standard practice after cardiothoracic surgery. Chemello D et al. ^[8] reported three PVT episodes related to the R-on-T phenomenon caused by undersensing of the pacing wire in a single patient. Nakamori Y et al. ^[9] reported a case of the R-on-T

phenomenon caused by undersensing of the epicardial pacing wire in a patient who underwent coronary artery bypass surgery. Hence, there is a need for careful evaluation of temporary pacing after myocardial infarction on daily basis. Also, turn off temporary pacemaker generators when pacing support is no longer required.^[8]

Conclusion

The case report highlights the importance of diagnosis of VF/VT due to R on T phenomenon induced by temporary pacemaker and its immediate management to decrease morbidity and mortality in such cases.

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Abbreviations

- RCA- Right coronary artery
LAD- Left anterior descending artery
DC- Direct current
ECG-Electrocardiogram
PCI- Percutaneous Coronary Intervention
VVI- Ventricle (sensed) Ventricle (paced) Inhibits (pacing output)
VF- Ventricular Fibrillations
VT- Ventricular Tachycardia
PTCA- Percutaneous Transluminal Coronary Angioplasty

Legend Figure

Fig 1: Ecg of the patient showing ST Elevation in leads II, III, a VF.

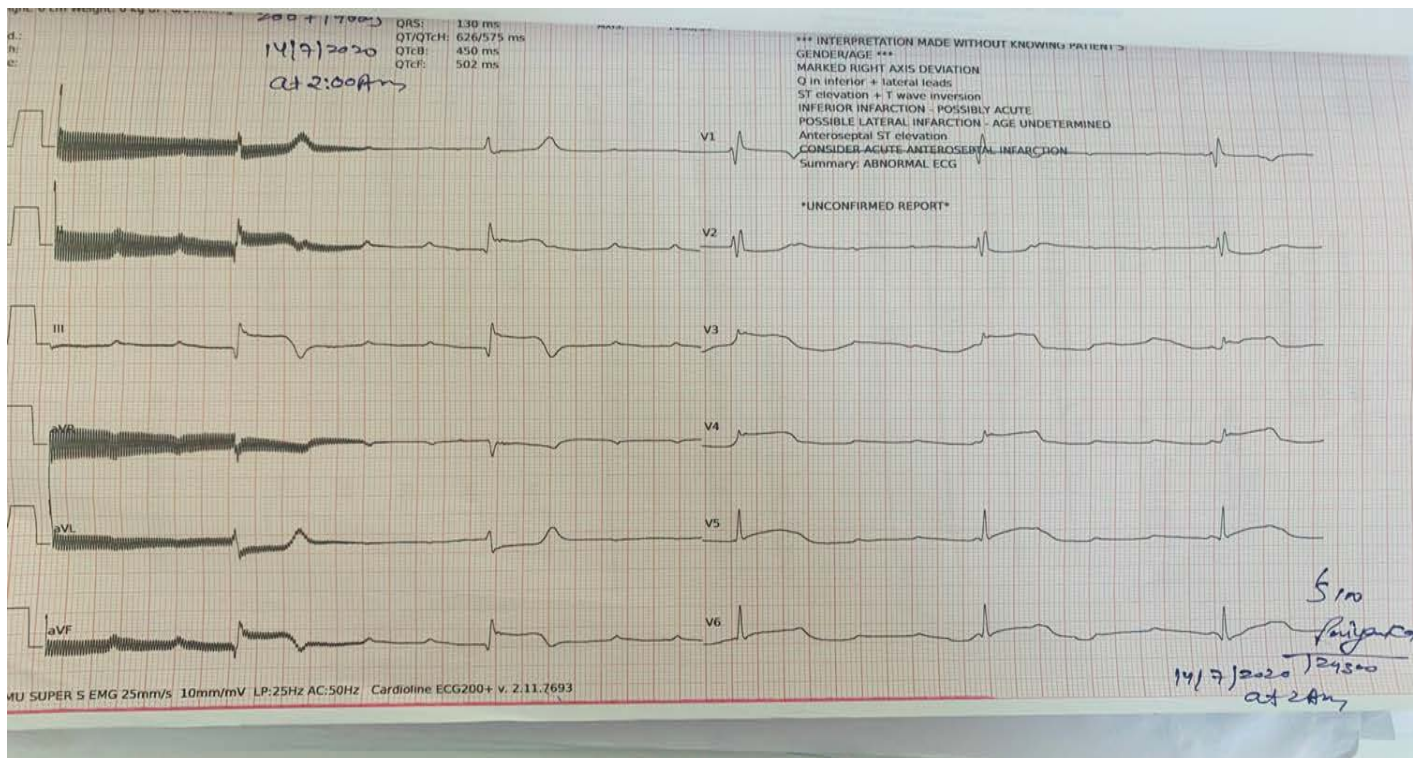


Fig. 2: Shows R on T phenomenon.



Fig 3: Coronary angiography of the patient before and after stenting.

