Nitroglycerine-Responsive Ischemic Bigeminal Right Bundle Branch Block; A Case Report

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Abstract

Rationale
Nitroglycerin is an established commonly prescribed short-acting anti-anginal and antihypertensive agent. But historically, it is an unknown antiarrhythmic drug. Nitroglycerin is alleviating anginal symptoms in ischemic heart disease. Ischemic heart disease is a possible significant cause of premature ventricular contractions bigeminy. The right bundle branch block represents an important electrocardiographic cardiac entity. Simultaneous co-presence of both the right bundle branch block with premature ventricular contractions bigeminy is extremely rare.

Patient Concerns
An elderly, heavy cigarette smoker, the male patient presented with simultaneous co-presence of both right bundle branch block and premature ventricular contractions bigeminy with a history of ischemic heart disease.

Diagnosis
Ischemic bigeminal right bundle branch block.

Interventions
Detailed physical examination, and pulse oximetry assessment electrocardiography, and echocardiography.

Lessons
Clearing the effective role of nitroglycerin as an antiarrhythmic drug in premature ventricular contractions bigeminy. Simultaneous co-presence of both the right bundle branch block with premature ventricular contractions bigeminy is extremely rare.

Outcomes
Dramatic termination of premature ventricular contractions bigeminy with nitroglycerin intravenous infusion.

Keywords
Nitroglycerine, Ischemic Bigeminal Right Bundle Branch Block, Bigeminy, Right Bundle Branch Block.

Abbreviations
Electrocardiograph (ECG), European Society of Cardiology (ESC), Hypertension (HTN), Intensive Care Unit (ICU), Ischemic Heart Disease (IHD), Intravenous Infusion (IVI), Left Descending Artery (LAD), Left Bundle Branch Block (LBBB), Premature Ventricular Contractions (PVCs), Right Bundle Branch Block (RBBB), Sudden Cardiac Death (SCD), Structural Heart Disease (SHD).

Introduction
Nitroglycerin is the oldest and most commonly prescribed short-acting anti-anginal agent. Despite being in clinical use since 1879, there remains an important need to educate both patients and health care providers on the various benefits of short-acting nitrates [1]. Nitrates produce vasodilation with predominant venous effects on large capacitance vessels. They also increase coronary collateral circulation, increase aortic compliance and conductance and blood flow to ischemic areas of the myocardium. Besides, nitrates alleviate anginal symptoms by directly influencing the coronary arteries, coronary collateral circulation, aortic compliance and conductance, and blood flow to ischemic areas of the myocardium [2]. Short-acting nitrates are beneficial in acute myocardial ischemia [3]. Although nitroglycerin is clinically effective in the therapy of this condition, its exact mechanism of action is still uncertain [4]. Because of clinical observations suggesting that nitroglycerin may suppress premature ventricular complexes during acute ischemia, a study was undertaken to assess the effect of nitroglycerin on the incidence of premature ventricular complexes in patients with...
PVCs are characterized by premature and bizarre shaped QRS-complexes that are unusually long (typically >120 msec) and appear wide on the ECG. The QRS-complexes are not preceded by a P-wave, and the T-wave is usually large and oriented in a direction opposite the major deflection of the QRS [7]. Depending on whether there are one, two, or three normal beats between each PVC, the rhythm is called bigeminy, trigeminy, or quadrigeminy, etc., [8]. The two beats are figuratively similar to two twins (hence Bi- + Gemini) indicates the number (2) [9]. Gemini is a prefix of is represented by the twins.

So, PVCs Bigeminy means a cardiac arrhythmia in which every second beat is a ventricular premature complex (extrasystole) or one sinus beats between extrasystoles [8]. PVC is a type of arrhythmia characterized by premature heart contractions originating in one of the ventricles [8]. PVCs are early depolarization of the myocardium originating in the ventricle [8] caused by an electrical impulse or ectopic rhythm from any part of the ventricles, including the ventricular septum before the sinoatrial impulse has reached the ventricles [8]. PVCs in absent structural heart disease (SHD) is safe once the risk factors excluded [10]. PVC’s with SHD is considered a hallmark to sudden cardiac death (SCD) [10]. Cohort studies showed that PVCs are associated with increased ischemic heart disease (IHD) events and SCD [11]. Because PVCs with established IHD may be viewed as a marker of disease severity or as an endpoint in the natural history of the disease process [10]. The presence of PVCs in patients of IHD is associated with a poor prognosis [10].

Right Bundle Branch Block (RBBB) is defined as a prolongation of QRS duration ≥120 ms, with an rsr’, rsR’, or rSR’ pattern in lead V1 or V2 [12]. The RBB traverses the interventricular septum across the cardiac apex. Indeed, damage of the interventricular septum and the RBB mostly occurs by acute anterior severe ischemia due to a very proximal left anterior descending artery occlusion [12]. However, newly-onset and chronic RBBB is an important independent risk factor for future adverse in-hospital serious events [13]. The RBBB can be classified according to onset time, duration, and accompanied fascicular block [13]. Interestingly, broadening QRS-duration with RBBB may indicate great damage for the conduction system including RBBB and left bundle branch block (LBBB) from ischemia or infarction yielding a high opportunity for early aggressive reperfusion or revascularization [12]. Certainly, the current ESC guidelines suggest a primary percutaneous coronary intervention strategy when persistent ischemic symptoms occur in patients with persistent ischemic symptoms and RBBB, but the level of evidence is not high [13]. Whatever, a broadening QRS-duration with RBBB may indicate great damage for the conduction system including RBBB and LBBB from ischemia or infarction would not explain the poorer prognosis [12]. Many studies had revealed a positive relationship between RBBB and all-cause mortality [14], while others never reported this association [14]. Regarding the blood supply of the RBB is mainly provided by LAD or the proximal septal perforator branch. However, newly-onset RBBB may indicate the proximal occlusion of the LAD and large infarction with subsequent acute heart failure, complete heart block, serious arrhythmia, and a high mortality rate [13].

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**Case Presentation**

A 70-year-old, heavy cigarette smoker, Egyptian farmer, the male patient presented in the Emergency room with dizziness. The patient gave a history of IHD and hypertension (HTN). He is a heavy cigarette smoker (30 cigarettes for about 25 years). Upon general physical examination; generally, the patient was anxious. The heart rate was irregular of 70 bpm, the blood pressure of 160/100 mmHg, the respiratory rate of 18 bpm, the temperature of 36.7 °C, the pulse oximeter of O2 saturation of 97%, and irregular heart rate on heart auscultation. No more relevant clinical data were noted during the clinical examination. The patient admitted to the intensive care unit (ICU). The initial emergency ECG tracing showed RBBB with bigeminy with ST-segment depression in III and V4-6 leads (Figure 1).
The requested workup was: Electrolytes profile show: Na+: 139 mmol/l, K+: 3.9 mmol/L, ICa++: 1.1 mmol/L, Hb: 14.1 gm/dl. Random blood glucose: 123 mg/dl. The troponin test was negative (below the normal level). Thyroid function tests were normal. The echocardiographic report showed evidence of IHD with apical and lateral wall hypokinesia with diastolic dysfunction and low ejection fraction (52%, that was measured with 2-D) (Figure 3A-B). The patient continued on nitroglycerin retard (2.5 capsules; BID) on discharge with no future problems.

**Figure 3:** Echocardiography showed evidence of IHD with apical and lateral wall hypokinesia (red arrows) with diastolic dysfunction (lime arrows) (A) and low ejection fraction (52%, that was measured with 2-D) (B).

### Discussion

**Overview:** An elderly, heavy cigarette smoker, the male patient presented with simultaneous co-presence of both right bundle branch block and premature ventricular contractions bigeminy with a history of ischemic heart disease.

The **Primary Objective** for my case study was the presence of simultaneous co-presence of both right bundle branch block and premature ventricular contractions bigeminy in ECG.

The **Secondary Objective** for the case study was the dramatic termination of premature ventricular contractions bigeminy with nitroglycerin intravenous infusion.

**Limitations of The Study:** Otherwise nitroglycerin contraindications, there are no known limitations in the study.

**Conclusion**

- Clearing the effective role of nitroglycerin as an antiarrhythmic drug in premature ventricular contractions bigeminy.
- Simultaneous co-presence of both the right bundle branch block with premature ventricular contractions bigeminy is an extremely rare.

**Acknowledgement**

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**Conflicts of Interest**

There are no conflicts of interest.

**References**


