BMH MEDICAL JOURNAL

BMH Med. J. 2020;7(1):1-3. **Editorial**

Bidirectional Ventricular Tachycardia

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Abstract

Bidirectional ventricular tachycardia is the classical arrhythmia of digoxin toxicity. Common observation is 180 degrees swing in frontal plane QRS axis with a basic right bundle branch block pattern. Alternate right and left bundle branch block patterns can also occur. Other causes of bidirectional ventricular tachycardia are aconite poisoning, myocarditis, myocardial infarction, metastatic cardiac tumour and sometimes hypokalemia.

Two inherited cardiac channelopathies which can cause bidirectional ventricular tachycardia are catecholaminergic polymorphic ventricular tachycardia and Anderso-Tawil syndrome. It may be noted that epinephrine is contraindicated in catecholaminergic polymorphic ventricular tachycardia with cardiac arrest. Intravenous opioid and general anaesthesia are recommended instead.

Keywords: bidirectional ventricular tachycardia, digoxin toxicity, CPVT, Andersen-Tawil syndrome

Bidirectional ventricular tachycardia (BDVT) is a rare form of ventricular tachycardia with alternating two types of QRS complexes in opposite directions (**Figure 1**). BDVT is the classical arrhythmia of digoxin toxicity [1]. Other causes for BDVT include myocarditis, myocardial infarction [2], metastatic cardiac tumour [3] and aconite poisoning [4].

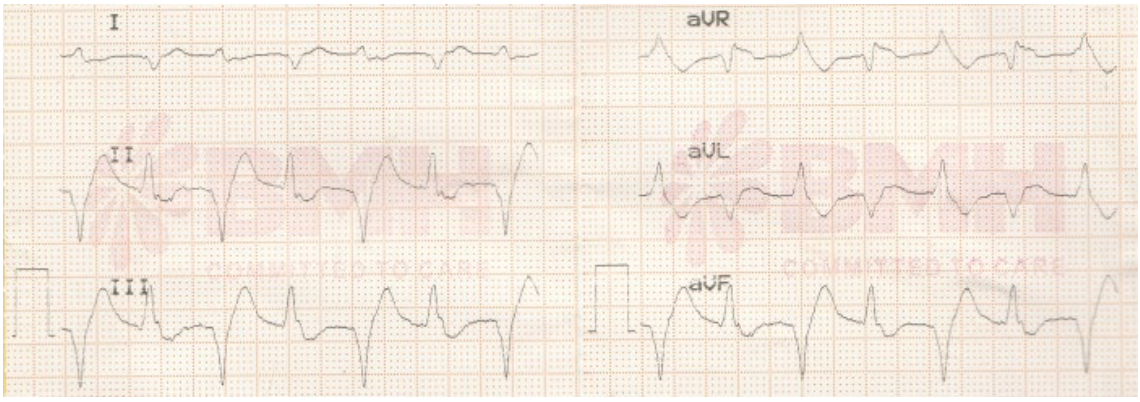

Figure 1: Bidirectional ventricular tachycardia.

Two inherited arrhythmogenic disorders (cardiac channelopathies) which can cause BDVT are catecholaminergic polymorphic ventricular tachycardia (CPVT) and Anderso-Tawil syndrome [5]. An interesting aspect about BDVT in patients with CPVT is worth remembering. These children may develop cardiac arrest and receive epinephrine (adrenaline) during resuscitation as per protocol. But this can be counter-productive and life threatening in this situation as the arrhythmia can worsen with the administration of epinephrine. Only high index of suspicion in these usually young subjects can help us clinch the diagnosis and avoid epinephrine. Suspicion can be raised by the presence of polymorphic or bidirectional ventricular tachycardia. Intravenous opioid and general anesthesia are recommended strategies in this scenario to control the arrhythmia. Flecainide may be another useful option [6].

Hypokalemia is another potential cause for BDVT [7]. Interestingly, a case of BDVT due to ACTH producing pheochromocytoma with hypokalemia has also been reported in literature [8]. Lindow T et al reported another two cases of BDVT due to pheochromocytoma [9] Cardiac sarcoidosis is another rare reported cause of BDVT [10].

Another rare situation in which accelerated idioventricular rhythm in the setting of acute myocardial infarction degenerated into BDVT has been documented [11]. Usually accelerated idoventricular rhythm is a self limited arrhythmia, often considered as a reperfusion arrhythmia in acute myocardial infarction.

In a report by Yeo C et al, BDVT occurred during ablation of monomorphic ventricular tachycardia in a person with ischemic cardiomyopathy [12]. It terminated on applying another radiofrequency lesion adjacent to the first lesion within 3 seconds. There was no recurrence of arrhythmia during a 6 month follow up period.

BDVT has been described as early as 1922. Both trigerred activity and enhanced automaticity has been proposed as mechanisms for BDVT. Common observation is 180 degrees swing in frontal plane QRS axis with a basic right bundle branch block pattern. Alternate right and left bundle branch block patterns can also occur. A unique case in which BDVT had characteristics of both re-entry and triggered activity has been demonstrated by Durrani SA et al [13]. In this case it could be terminated by a focal radiofrequency lesion.

Treatment options for BDVT will naturally depend on the cause. Digoxin antibody Fab fragment will be the natural choice in digoxin toxicity. Correction of hypokalemia should always be done if present. Flecainide has been reported to be successful in eliminating BDVT in Andersen-Tawil syndrome [14]. Radiofrequency ablation is sometimes useful as noted by Durrani et al [13]. In another case of BDVT, apical left ventricular aneurysm was found to be the site of origin and was successfully treated by ablation [15]. Hemodialysis has been used to remove high levels of caffeine from blood caused by ingestion of caffeine containing supplement, presenting with cardiac arrest and BDVT on attainment of ROSC (return of spontaneous circulation) [16].

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