VOLUME - 15, ISSUE - 07, JULY - 2026 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Cardiology

HIGH RISK BRUGADA SYNDROME UNMASKED BY RECURRENT MICTURITION SYNCOPE, AGGRAVATED BY BETA-BLOCKER THERAPY, WITH COEXISTING MITRAL VALVE PROLAPSE: A CASE REPORT

Dr. Sai Rohan Nutalapati* MBBS, NRI Medical College and General Hospital, Guntur*Corresponding Author

Dr. Venkata Sesha Sai Varun Gaddam MBBS, Tutor, Department of Forensic Medicine, NRI Medical College and General Hospital, Guntur

ABSTRACT Brugada Syndrome is an inherited cardiac-channelopathy characterized by sudden cardiac death due to arrhythmic causes in structurally normal heart. Distinguishing between lethal and benign causes of syncope in the emergency room remains a challenge. A male patient in early 20s, working as emergency-medical-personnel presented with recurrent nocturnal micturition syncope accompanied by palpitations. Although prior episodes were managed as vasovagal events, further investigation through a 12-lead-electrocardiogram using high precordial lead placement unmasked a spontaneous type-1 Brugada Pattern (Figure 1). Symptoms were aggravated by metoprolol, which blunted sympathetic support of ventricular repolarization and left the vagal surge associated with nocturnal micturition unopposed. Transthoracic echocardiography confirmed an additional case of prolapse of the anterior mitral leaflet (Figure 3). Although contrast-enhanced cardiac magnetic resonance imaging did not reveal myocardial fibrosis in the papillary muscles or inferobasal wall (Figures 6,7), the mitral valve prolapse might have been a mechanical trigger for premature ventricular complexes (PVCs) (Figure 5) in an already predisposed myocardium. The patient underwent successful transvenous single-chamber implantable cardioverter-defibrillator placement, considered a Class IIa indication for a patient with a spontaneous type 1 Brugada pattern and arrhythmic syncope according to the 2022 ESC guidelines. This case highlights the fact that nocturnal situational syncope associated with palpitations should not be prematurely dismissed as benign, particularly in young patients with a family history of sudden cardiac death. This case report highlights the interaction between Beta-blocker therapy and Brugada syndrome, and the role of Cardiac MRI in excluding Arrhythmogenic Mitral Valve Prolapse (MVP).

KEYWORDS : Brugada Syndrome; Micturition Syncope; Mitral Valve Prolapse; Flecainide Challenge Test; Cardiac Channelopathy; Implantable Cardioverter-Defibrillator (ICD)

INTRODUCTION

Brugada syndrome is an autosomal dominant inherited channelopathy caused by loss of function mutations in SCN5A, encoding the cardiac sodium channel Nav1.5 marked by the presence of coved ST segment elevation in right precordial leads (V_1 to V_3) and elevated risk of sudden cardiac death due to polymorphic ventricular tachycardia or ventricular fibrillation [1][2]. It is a rare condition with a prevalence of 1-5 per 10,000 individuals, most commonly affecting young to middle-aged men (South-east Asians particularly) [3]. The key issue in differentiating between arrhythmic syncope and benign reflex mediated vasovagal syncope is the latter's management. Micturition syncope is classically managed as benign. However, when syncope is preceded by palpitations or is linked to a history of sudden cardiac death within families, cardiac causes must be ruled out [4]. This case report outlines a scenario where a health care worker developed micturition syncope that was treated as benign reflex mediated vasovagal syncope, was aggravated by beta-blocker administration and MVP.

CASE PRESENTATION

Patient Information –

A 24-year-old male healthcare professional presented to the ER right after experiencing syncope. At approximately 2AM, syncope occurred when he was urinating during a night shift, which preceded by palpitations and dizziness, resulting in a fall and subsequent trauma to the right shoulder and occipital area of the head; there were no signs of seizures. Past medical history was notable for palpitations and chest pain since approximately two and a half years prior to presentation. Echocardiography performed approximately one month after symptom onset, revealed a septal thickness at the upper limit of normal (0.9 cm) and anterior MVP with mild MR (Figure 3). Metoprolol 25 mg daily was recommended. A similar episode occurred approximately 17 months prior to the current presentation, when the patient fainted after urination. A 3-day Holter recorded occasional premature ventricular complexes (PVCs) and premature atrial complexes (PACs) (Figure 5), with no sustained arrhythmia diagnosed and the cause of the episode being vasovagal. Family history was significant for sudden cardiac death in his paternal grandfather at age 50 years. (Table 1)

Clinical Findings –

Upon arrival, the patient was awake, anxious, and hemodynamically stable (BP 145/95 mm HG, heart rate 82bpm). On physical examination, there was tenderness and soft tissue swelling noted over the right shoulder joint and mild occipital scalp tenderness, with an otherwise normal cardiopulmonary and neurological examination.
Timeline (Table 1)

Diagnostic assessment –

Continuous telemetry showed occasional ectopic activity. A standard 12 lead ECG showed sinus tachycardia with rate of 101 beats/min, left atrial enlargement and nonspecific saddleback ST elevation in V_1, V_2 (Figure 2). When leads V_1, V_2 were repositioned to the high costal site (2nd intercostal space), ECG demonstrated spontaneous coved ST elevation with follow up symmetric T-wave inversion, diagnostic of a type 1 Brugada pattern (Figure 1).

Transthoracic echocardiography (Figure 3) revealed normal biventricular dimensions, normal systolic function (EF – 64%) with isolated anterior mitral valve prolapse. A flecainide challenge test (2mg/kg in 10 mins) unmasked and accentuated coved ST elevation in V_1 and V_2 leads (Figure 4), confirming Brugada syndrome. Cardiac MRI demonstrated normal structure ad function (Ejection Fraction – 65%), and absence of late gadolinium enhancement in papillary muscles and in inferobasal wall (Figures 6 and 7). Electrolytes and troponin I levels were normal. Differential diagnosis includes vasovagal syncope, Brugada syndrome, arrhythmic MVP and catecholaminergic polymorphic ventricular tachycardia. (Table 1)

Laboratory parameters were within normal physiological ranges: potassium 4.1 mEq/L, magnesium 2.2 mg/dL.

Shanghai Score calculation:
Spontaneous Type 1 ECG = 3.5 points;

Syncope consistent with arrhythmia (palpitations preceding syncope) = 2.0 points;

Family history of premature SCD (grandfather, second-degree relative) = 1.0 point;

Total = 6.5 points (≥3.5 points = probable/definitive diagnosis of Brugada Syndrome) [5].

Therapeutic Intervention –
Metoprolol was discontinued immediately. Since there was syncope following palpitations (suggesting self-terminating polymorphic ventricular tachyarrhythmias), spontaneous type 1 Brugada syndrome, and family history of sudden cardiac death, he was classified high risk. Based on electrophysiology consultation, a single chamber transvenous implantable cardioverter defibrillator (ICD) was successfully implanted. The patient was counselled regarding avoiding medications listed on www.brugadadrugs.org, immediate treatment of fever, and clinical screening of first-degree relatives. Follow-up assessments in Brugada syndrome emphasize the necessity of meticulous diagnostic evaluation and long-term risk stratification to prevent life-threatening ventricular arrhythmias.

Follow up and Outcomes –
The post procedural period was unremarkable. During follow up at 1 and 3 months, the patient reported complete symptom resolution and had returned to work. The interrogation of the device revealed stable sensing and pacing thresholds, with zero appropriate or inappropriate ICD therapies.

DISCUSSION

The presentation initially mimicked benign micturition syncope. Micturition causes rapid decompression of the bladder wall leading to stimulation of the parasympathetic afferent fibres, resulting in sudden withdrawal of sympathetic tone and a massive parasympathetic (vagal) surge. In Brugada syndrome high vagal tone causes decrease in the depolarising L-type calcium channel current via muscarinic receptor activation, causing net outwards current dominance [6]. This increases the notching of the right ventricular epicardial action potential, creating transmural and spatial dispersion of repolarization. A PVC falling within this vulnerable window can initiate re-entry of phase 2, degenerating into polymorphic ventricular tachycardia or ventricular fibrillation.

Metoprolol was acting as the autonomic catalyst. Beta-adrenergic receptor stimulation enhances $I_{Ca,L}$ current, restoring the dome of the action potential, thus maintaining electrical homogeneity across the right ventricular outflow tract epicardium. Conversely, Metoprolol would prevent this sympathetic drive, leaving vagal tone completely unopposed. This autonomic imbalance lowered the threshold for phase 2 re-entry, particularly during early morning hours characterised by physiological vagal dominance [6][7].

One abnormality seen is the spontaneous termination of the arrhythmia after fall. The fall resulted in somatic injuries on the right shoulder as well as the occipital part of the head. This somatic pain likely triggered a sympathetic discharge (acute adrenergic surge). As mentioned above, the rise in the levels of catecholamines causes beta-receptor stimulation causing a swift, intracellular cyclic adenosine monophosphate (cAMP) mediated rise in $I_{Ca,L}$ [8]. Thus, the fast adrenergic surge causes the prolongation of epicardial action potential, restores the action potential dome and changes the slope of the action potential duration restitution. This sudden electrical synchronization across the myocardium can disrupt the re-entrant wave forms, terminating the arrhythmia and restoring sinus rhythm before permanent cerebral ischemia occurs [9].

Concomitant MVP further complicates matters. Arrhythmogenic MVP is typically associated with Myocardial fibrosis on Cardiac MRI; This patient's scan revealed no evidence of LGE. However, even in the absence of myocardial fibrosis, the mechanical effect of the prolapsed leaflet may induce stretch-activated early after-depolarisation, manifested as isolated ectopic beats detected during Holter monitoring (Figure 5). In the setting of a highly vulnerable Brugada substrate sensitized by metoprolol and high vagal tone, these ectopic beats triggered by mechanical activation served as secondary triggers for Ventricular fibrillation [10].

One of the greatest strengths of our diagnostic approach was the extensive multimodality evaluation including high-lead precordial ECGs, provocation with drugs, and contrast enhanced Cardiac MRI, which allowed us to rule out structural or infiltrative substrates and confirm a primary channelopathy. One of the main limitations of the workup was that no genetic testing was done (such as screening for SCN5A mutations), as the patient refused it. However, genetic testing confirms only 20-30% of clinical diagnosis.

CONCLUSION

This case illustrates that nocturnal micturition syncope associated with palpitations should not be considered vasovagal syncope when there is a family history of sudden cardiac death but should raise suspicions about Brugada Syndrome requiring ECG evaluation. Beta-blocker therapy, rather than being protective unmasked and aggravated the underlying channelopathy by leaving vagal tone unopposed during a physiological vagal surge associated with micturition. Coexisting mitral valve prolapse might have provided an additional arrhythmic mechanical trigger despite the absence of myocardial fibrosis on Cardiac MRI. Early recognition, discontinuation of the offending beta-blocker, and risk-stratified ICD implantation resulted in complete symptom resolution.

LEARNING POINTS

- Nocturnal micturition syncope accompanied by palpitations, especially with a family history of sudden cardiac death, should prompt ECG evaluation for Brugada syndrome before being labelled vasovagal.
- Beta-blockers can unmask or aggravate Brugada syndrome by leaving vagal tone unopposed during physiological vagal surges such as micturition.
- Relocating precordial leads V1/V2 to the second intercostal space, or performing a flecainide challenge, improves detection of the type 1 Brugada pattern when standard ECGs are non-diagnostic.
- Coexisting mitral valve prolapse may provide a mechanical arrhythmic trigger even without CMR evidence of fibrosis, compounding risk in a Brugada substrate.

PATIENT PERSPECTIVE

Patient was happy and relieved that he was diagnosed, but he felt a bit hesitant for the ICD placement due to lifestyle difficulties and social discomfort. He later expressed how ICD gave confidence to continue working. He also became more mindful of avoiding potential arrhythmia triggers, including certain over-the-counter medications and untreated fever.

INFORMED CONSENT

The patient provided written informed consent for the submission of this case report, including all de-identified clinical details, laboratory investigations, electrocardiograms, echocardiogram and other cardiac imaging.

CONFLICT OF INTEREST

There is no conflict of interest among the contributing authors.

FUNDING

No funding was obtained for this study.

ACKNOWLEDGMENTS

The authors sincerely thank the Department of Cardiology, NRI Medical College and General Hospital, Guntur.

LEGENDS

Figure 1. High-precordial ECG (V1-V2 at 2nd intercostal space) showing coved-type ST-segment elevation ≥2 mm with symmetric inverted T waves, diagnostic of type 1 Brugada pattern.

Figure 2. Pre-flecainide test baseline EKG (taken at 10:30 hrs)

Figure 3. Transthoracic echocardiogram showing isolated anterior mitral leaflet prolapse with trivial mitral regurgitation.

Figure 4. Flecainide provocation test (administered at 11:00 hrs) showing accentuation of coved ST-segment elevation in V1-V2 within 30 minutes.

Figure 5. 72-hour Holter monitor showing occasional premature ventricular complexes (PVCs) and premature atrial complexes (PACs) without sustained tachyarrhythmia.

Figure 6. Cardiac MRI showing normal ventricular volume and contraction segments.

Figure 7. Cardiac MRI late gadolinium enhancement sequence showing absence of LGE, ruling out myocardial scarring.

Table 1. Timeline of presentation and course of management.

Timepoint (Relative to Presentation)	Clinical Event	Diagnostic Findings / Interventions
Approximately 2.5 years prior to presentation	First onset of morning palpitations and intermittent chest pain.	Echocardiography: MVP on anterior leaflet and mild mitral regurgitation (Image 3). Treatment with Metoprolol 25 mg-per-day.
Approximately 17 months prior to presentation	First syncopal attack in the morning after micturition.	3-Day Holter recording: PVCs and PACs (Image 5). Diagnosis: Vasovagal Syncope.
Current Admission (Day 0, 02:00)	Syncope in the restroom while urinating.	Hemodynamically stable, with head and shoulder contusions. Cardiac monitoring was started.
Current Admission (ED Eval)	Electrocardiography.	Precordial lead ECG (V1 and V2 in 2nd intercostal space) unmasks coved Type 1 Brugada pattern (Image 1).
Day 4 of admission	Elective cardiac evaluation for structural pathology.	Cardiac MRI: Normal ventricular volume and normal contraction segments with no late gadolinium enhancement (Images 6 and 7).
Current Admission (Hospitalization)	Provocation testing and therapeutic intervention.	Flecainide provocation test in the cardiac intensive care unit confirms Brugada syndrome (Image 4). Metoprolol discontinued. Single-chamber transvenous ICD implanted.
1, 3 Months Follow-up	Outpatient clinic visits.	Asymptomatic; No Arrhythmias

FIGURE 1:

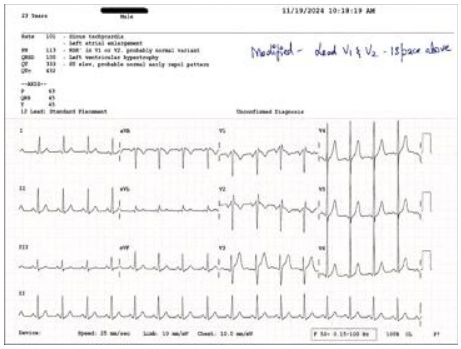


FIGURE 2:

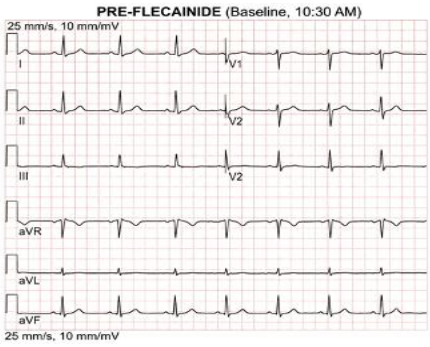


FIGURE 3:

FIGURE 4:

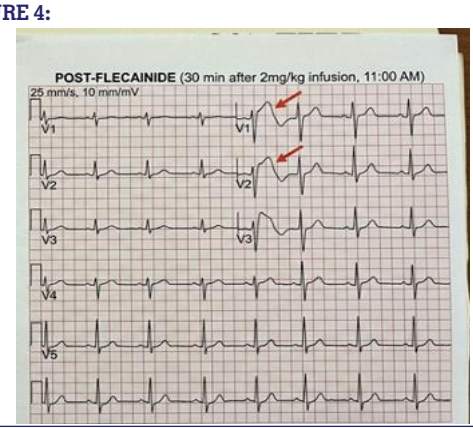


FIGURE 5:

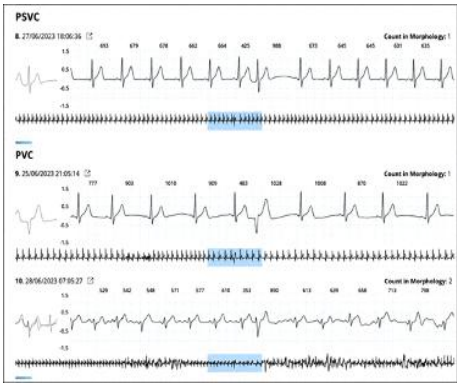


FIGURE 6:

CE- CARDIAC MAGNETIC RESONANCE IMAGING (CMRI)

Clinical data: H/o 2 episodes of syncopal attacks; episodes of varying heart rate recently; To rule out Brugada syndrome and any other myocardial infiltrative disorders.

Indication: For myocardial viability.

Findings:

Normal situs. Mediastinum appears normal. No mediastinal lymphadenopathy.
IVC and hepatic veins appear normal. Pulmonary veins appear normal.

Right atrium and right ventricle appear normal.

Valves appear normal.

Visualised segments of the left ventricle are contracting well.

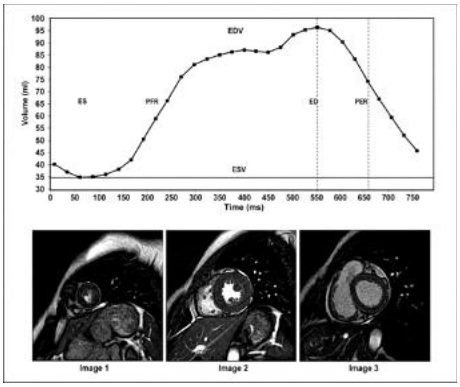
Post contrast late gadolinium imaging showed no evidence of enhancement.

Normal appearance of the pericardium. No thickening or pericardial effusion or enhancement.
No LV obvious aneurysm or thrombus in present scan.

LV volumetry :

	ESV(ml)	EDV(ml)	EF (%)	SV(ml)
LV	33.5	96.9	65	63.4

FIGURE 7:



REFERENCES

1. Kapplinger JD, Tester DJ, Alders M, Benito B, Berthet M, Brugada J, et al. An international compendium of mutations in the SCN5A-encoded cardiac sodium channel in patients referred for Brugada syndrome genetic testing. Heart Rhythm. 2010;7(1):33–46. DOI: https://doi.org/10.1016/j.hrthm.2009.09.069
2. Watanabe H, Koopmann TT, Le Scouarnec S, Yang T, Ingram CR, Schott JJ, et al. Sodium channel 1 subunit mutations associated with Brugada syndrome and cardiac conduction disease in humans. J Clin Invest. 2008;118(6):2260–2268. DOI: https://doi.org/10.1172/JCI33891
3. Antzelevitch C, Brugada P, Borggrefe M, Brugada J, Brugada R, Corrado D, et al. Brugada syndrome: report of the second consensus conference endorsed by the Heart Rhythm Society and the European Heart Rhythm Association. Circulation. 2005;111(5):659–670. DOI: https://doi.org/10.1161/01.CIR.0000152479.54298.51
4. Brignole M, Alboni P, Benditt DG, Bergfeldt L, Blanc JJ, Thomsen PE, et al. Guidelines on management (diagnosis and treatment) of syncope—update 2004. Europace. 2004;6(6):467–537. DOI: https://doi.org/10.1016/j.eupc.2004.08.008
5. Splawski I, Timothy KW, Decher N, Kumar P, Sachse FB, Beggs AH, et al. Severe arrhythmia disorder caused by cardiac L-type calcium channel mutations. Proc Natl Acad Sci U S A. 2005;102(23):8089–8096. DOI: https://doi.org/10.1073/pnas.0502506102
6. Shen MJ, Zipes DP. Role of the autonomic nervous system in modulating cardiac arrhythmias. Circ Res. 2014;114(6):1004–1021. DOI: https://doi.org/10.1161/CIRCRESAHA.113.302549
7. Chen PS, Chen LS, Fishbein MC, Lin SF, Nattel S. Role of the autonomic nervous system in atrial fibrillation: pathophysiology and therapy. Circ Res. 2014;114(9):1500–1515. DOI: https://doi.org/10.1161/CIRCRESAHA.114.303772
8. Vaseghi M, Shivkumar K. The role of the autonomic nervous system in sudden cardiac death. Prog Cardiovasc Dis. 2008;50(6):404–419. DOI: https://doi.org/10.1016/j.pcad.2008.01.003
9. Garfinkel A, Kim YH, Voroshilovsky O, Qu Z, Kil JR, Lee MH, et al. Preventing ventricular fibrillation by flattening cardiac restitution. Proc Natl Acad Sci U S A. 2000;97(11):6061–6066. DOI: https://doi.org/10.1073/pnas.090492697
10. Antzelevitch C. Role of spatial dispersion of repolarization in inherited and acquired sudden cardiac death syndromes. Am J Physiol Heart Circ Physiol. 2007;293(4):H2024–H2038. DOI: https://doi.org/10.1152/ajpheart.00355.2007