

Reversible Heavy Premature Ventricular Contraction Burden Without Electrophysiology Intervention; Two Case Reports

Abstract:

PVCs, or premature ventricular complexes, are prevalent diagnoses in the general population and frequently show up incidentally in people. The sense of "skipped beats" might be brought on by PVCs emanating from ectopic ventricular nuclei. People with underlying cardiovascular illness, and electrolyte abnormalities such as hypomagnesemia, hypokalemia, and Vitamin D deficiency, as well as elderly adults, were shown to have a greater prevalence of PVC. We represent two instances of PVCs, one in a 33-year-old male and one in a 50-year-old woman, both of whom attended with sensations of palpitations, risk factors were determined, medically appropriately controlled, and the PVCs burden was diminished without intervention. Mitigating the use of antiarrhythmic medications and averting unnecessary electrophysiology procedures can be accomplished.

Keywords: Premature ventricular contraction, palpitation vitamin D, Gastroesophageal reflux, hypomagnesemia

Introduction:

Premature ventricular contractions (PVCs) originate from ectopic ventricular sources, and these premature beats can cause the sensation of 'fluttering' or 'skipped beats'. PVCs originate in the Purkinje fibers of the ventricles and disturb the regular pattern of conduction of normal sinus rhythm. The causes of PVCs are variable, and the exact cause is often unknown (1). It was noticed that the incidence of PVC increased with age, and individuals with underlying cardiovascular disease or electrolyte abnormalities such as hypomagnesemia, hypokalemia, and Vitamin D deficiency [2]. Researchers started to look for other treatment options than anti arrhythmic drugs that may decrease PVC burden without the side effects of antiarrhythmic drugs [3].

Case presentation:

Case 1:

A 33-year-old male, with a known case of Crohn's disease, Gastroesophageal reflux disease (GERD), and complex perianal disease (Fistula), presented for perianal abscess evacuation. However, surgery was postponed due to the high prevalence of PVCs on ECG. The cardiology team was consulted, and a 24-hour Holter monitor was applied showing frequent PVCs in the form of single, bigeminy, and trigeminy with no sustained ventricular tachycardia (Figure 1), then started on bisoprolol 2.5 mg daily and discharged on ciprofloxacin and metronidazole with follow up plan of PVC's radiofrequency ablation (RFA).

One month later, he presented again complaining of repeated attacks of palpitation associated with dizziness and severe epigastric pain likely attributed to prolonged use of two antibiotics and found to have trigeminy PVCs in the presenting ECG (Figure 2) he was maintaining his blood pressure, heart rate ranging from 36 to 77 beats per minutes (bpm) and had an unremarkable physical examination. The initial workup revealed a normal echocardiogram, thyroid function, and electrolytes. The magnesium level was borderline normal. ECG showed episodes of bigeminy, trigeminy PVCs, and sinus bradycardia. Beta-blocker was discontinued and was started on IV Magnesium replacement and maximum dose of proton pump inhibitor (PPI). Patient symptoms improved and he was discharged on oral magnesium and (PPI). On clinic follow-up, repeated 24-hour Holter monitoring showed an improvement in total PVCs burden from 28% to 8.3% (Figure 3). As a result, RFA was canceled.

Heart Rate Data			
Total Beats	: 108231	Beat analyzed %	: 97.300%
Min HR	: 44 BPM at 22:41:10		
Avg HR	: 76 BPM		
Max HR	: 124 BPM at 17:39:01		
Heart Rate Variability			
ASDNN 5	: 113.2 msec	SDNN	: 175.7 msec
SDANN 5	: 138.6 msec	RMSSD	: 113.6 msec
QT Analysis			
QT Min	: -	QTc Min	: -
QT Avg	: -	QTc Avg	: -
QT Max	: -	QTc Max	: -
QTc > 450 msec : -			
ST Episode Analysis			
		Ch1	Ch2
Min ST Level	:	-	-
Max ST Level	:	-	-
ST Episodes	:	-	-
Pacer Analysis			
Sinus Beats	: -	FTO	: -
Paced Beats	: -	FTS	: -
Atrial Paced	: -	FTC	: -
Ventricular Paced	: -		
Dual Paced Beats	: -		
Fusion Beats	: -		

Ventricular Ectopy	
Total VE Beats	: 30618 (28.3%)
Vent Runs	: 0
Beats	: 0
Longest	: 0
Fastest	: 0 BPM
Triplets	: 0 Events
Couplets	: 0 Events
Single/Interp PVC	: 12457/0
R on T	: 0
Single/Late VE's	: 1428/12
Bi/Trigeminy	: 11959/4762 Beats
Supraventricular Ectopy	
Total SVE Beats	: 1074 (1.0%)
Atrial Runs	: 0
Beats	: 0
Longest	: 0
Fastest	: 0 BPM
Atrial Pairs	: 0 Events
Drop/Late	: 0/360
Longest R-R	: 1.6 sec
Single PAC's	: 714
Bi/Trigeminy	: 0/0 Beats
Atrial Fibrillation	
AFib Beats	: 0 (0.0%)
Duration	: 0.0 min
Events	: 0

Figure 1. High PVCs burden in first 24 hours Holter monitor.



Figure 2. Electrocardiogram on admission showing PVCs in form of trigeminy.

Heart Rate Data			
Total Beats	:	91660	
Min HR	:	39 BPM at 12:07:25 PM	
Avg HR	:	64 BPM	
Max HR	:	118 BPM at 8:44:55 PM	
Heart Rate Variability			
ASDNN 5	:	124.5 msec	
SDANN 5	:	175.4 msec	
SDNN	:	223.5 msec	
ST Episode Analysis			
		Ch1	Ch2
Min ST Level	:	-	-
Max ST Level	:	-	-
ST Episodes	:	-	-
Pacer Analysis			
Single Paced Beats	:	-	
Dual Paced Beats	:	-	
Fusion Beats	:	-	
Atrial Fibrillation			
AFib Beats	:	0 (0.0%)	
Duration	:	0.0 min	
Events	:	0	

Ventricular Ectopy	
Total VE Beats	: 7583 (8.3%)
Vent Runs	: 0
Beats	: 0
Longest	: 0
Fastest	: 0 BPM
Triplets	: 0 Events
Couplets	: 0 Events
Single/Interp PVC	: 6551/2
R on T	: 0
Single/Late VE's	: 222/0
Bi/Trigeminy	: 232/576 Beats
Supraventricular Ectopy	
Total SVE Beats	: 860 (1.0%)
Atrial Runs	: 0
Beats	: 0
Longest	: 0
Fastest	: 0 BPM
Atrial Pairs	: 137 Events
Drop/Late	: 0/217
Longest N-N	: 1.7 sec at 11:33:00 AM
Single PAC's	: 389
Bi/Trigeminy	: 0/0 Beats

Figure 3. Reduction in PVCs burden in repeated 24 hours Holter monitor.

Case 2:

A 54-year-old female known to have type 2 diabetes mellitus, hypertension, dyslipidemia, Gastroesophageal reflux disease, and chronic kidney disease Status post-renal transplant **nine** years ago on immunosuppressive therapy, and vitamin D deficiency on replacement therapy. **She** referred to cardiology outpatient clinic as a case of palpitation for further evaluation. She presented with a complaint of sudden onset of palpitation at rest aggravated by stress that awakes her from sleep. She denies chest pain, loss of consciousness, or dizziness. On physical examination, her blood pressure was 120/62 mmHg, and her heart rate was 78 beats per Minute; **there** was no orthostatic hypotension or signs of right or left-side heart failure. Upon investigation, Complete blood count and biochemistry were normal, except for low serum magnesium of 0.6 mmol and Low vitamin D level. The ECG showed non-specific T-wave change and premature ventricular beats (Figure 4). The echocardiogram revealed ejection fraction (EF) > 60 %. Baseline 24h Holter showed PVC burden of 16 % (Figure 5) patient was started on oral metoprolol 25mg once daily in addition to oral magnesium supplement and proton pump inhibitor, the patient was advised to avoid excess citrate diet. On further clinic follow-up, she reported improvement of symptoms and repeated 24h, Holter, showed reduced PVC burden to 7.6 % (Figure 6) with Normal Magnesium level.

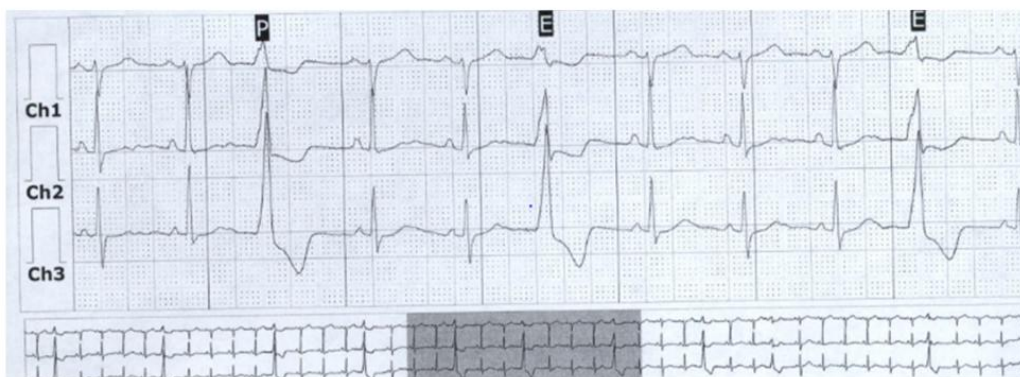


Figure 4. Electrocardiogram showing PVC.

Heart Rate Data				Ventricular Ectopy			
Total Beats	: 112158			Total VE Beats	: 18983 (16.9%)		
Min HR	: 49 BPM at 12:13:38 PM			Vent Runs	: 0		
Avg HR	: 80 BPM			Beats	: 0		
Max HR	: 115 BPM at 4:50:28 PM			Longest	: 0		
Heart Rate Variability				Fastest	: 0 BPM		
ASDNN 5	: 36.4 msec			Triplets	: 0 Events		
SDANN 5	: 60.5 msec			Couplets	: 2 Events		
SDNN	: 69.7 msec			Single/interp PVC	: 7463/111		
ST Episode Analysis				R on T	: 0		
	Ch1	Ch2	Ch3	Single/Late VE's	: 92/0		
Min ST Level	: -	-	-	Bi/Trigeminy	: 77/10408 Beats		
Max ST Level	: -	-	-	Supraventricular Ectopy			
ST Episodes	: -	-	-	Total SVE Beats	: 123 (0.1%)		
Pacer Analysis				Atrial Runs	: 0		
Single Paced Beats	: -			Beats	: 0		
Dual Paced Beats	: -			Longest	: 0		
Fusion Beats	: -			Fastest	: 0 BPM		
Atrial Fibrillation				Atrial Pairs	: 3 Events		
AFib Beats	: 0 (0.0%)			Drop/Late	: 0/12		
Duration	: 0.0 min		Events	Longest N-N	: 1.6 sec at 3:10:27 PM		
				Single PAC's	: 105		
				Bi/Trigeminy	: 0/0 Beats		
INTERPRETATION							
- 24 Hour Holter to evaluate 54 years old female for palpitation.							
- Maximum HR=115 (sinus). Minimum HR = 49 (sinus). Average = 80.							
- Isolated unifocal PVC's with PVC burden 16.9%.							

Figure 5. 24h Holter showing initial PVC burden.

Heart Rate Data				Ventricular Ectopy			
Total Beats	: 96304			Total VE Beats	: 7276 (7.6%)		
Min HR	: 50 BPM at 1:26:49 PM			Vent Runs	: 0		
Avg HR	: 68 BPM			Beats	: 0		
Max HR	: 103 BPM at 1:46:59 AM			Longest	: 0		
Heart Rate Variability				Fastest	: 0 BPM		
ASDNN 5	: 48.7 msec			Triplets	: 0 Events		
SDANN 5	: 83.3 msec			Couplets	: 0 Events		
SDNN	: 93.2 msec			Single/interp PVC	: 1892/1580		
ST Episode Analysis				R on T	: 0		
	Ch1	Ch2	Ch3	Single/Late VE's	: 251/0		
Min ST Level	: -	-	-	Bi/Trigeminy	: 15/3538 Beats		
Max ST Level	: -	-	-	Supraventricular Ectopy			
ST Episodes	: -	-	-	Total SVE Beats	: 54 (0.1%)		
Pacer Analysis				Atrial Runs	: 0		
Single Paced Beats	: -			Beats	: 0		
Dual Paced Beats	: -			Longest	: 0		
Fusion Beats	: -			Fastest	: 0 BPM		
Atrial Fibrillation				Atrial Pairs	: 0 Events		
AFib Beats	: 0 (0.0%)			Drop/Late	: 0/8		
Duration	: 0.0 min		Events	Longest N-N	: 1.6 sec at 5:52:44 AM		
				Single PAC's	: 43		
				Bi/Trigeminy	: 0/3 Beats		
INTERPRETATION							
- 24 Hour Holter to evaluate 54 years old female for PVC burden.							
- Maximum HR=103 (sinus). Minimum HR = 50 (sinus). Average = 68.							
- Isolated unifocal PVC's with PVC burden of 7.6% (burden is less compared to previous study).							

Figure 6. 24h Holter showing PVC burden after Vitamin D replacement.

Discussion:

Gastroesophageal reflux disease (GERD) is one of the most frequent gastrointestinal diseases encountered in outpatient clinics⁽¹⁾. The prevalence of this condition is growing, and its annual prevalence rate varies between 0.8% and 40% in different populations⁽²⁾. It is defined as when stomach contents **returning** to the esophagus, resulting in symptoms or complications^(3,4). Premature ventricular complexes (PVCs) are a common diagnosis among the general population and often present as an incidental finding in up to 10.7% of individuals. Many aetiologies exist for underlying PVCs; some may precede more ominous diagnoses, including ventricular fibrillation (VF) and death^(5,6). The electrical stability of the heart is maintained by electrolyte homeostasis. Potassium and magnesium are two of the most critical minerals contributing to myocyte generation and regulation of ion channel transport processes. This is essentially involved in creating normal cellular excitability, proper and uniform impulse propagation, and regular ventricular recovery. Experimental and clinical studies have shown that low plasma concentrations of the two minerals increase the risk of induction, facilitation, or aggravation of ventricular tachyarrhythmias (VTs)^(7,8,9). So, it is important to investigate **fundamental** underlying causes to start initial management if needed and to focus on identifying and treating these causes.

Our first case report demonstrates that GERD can be responsible for a high burden of PVCs and decreasing gastric acidity by acid secretion inhibitors such as proton pump inhibitors (PPI), avoiding risk factors like stress and antibiotics, in addition, to controlling the side effect of PPI can significantly lower PVCs burden. The patient started on PPI and was advised to avoid stress and long-term use of medications that increased gastric acidity. Magnesium replacement started on a combination of PPI as his serum magnesium level was borderline normal. Repeated Holter monitor in follow-up showed improvement in PVCs burden from 28% to 8.3%. Some studies showed an association between PPIs and hypomagnesemia, as the FDA issued a drug safety communication stating that low magnesium levels could be associated with long-term use of PPIs that may cause hypomagnesemia by decreasing intestinal magnesium absorption resulting in decreased urinary magnesium excretion^(10,11). Magnesium is regarded as a significant regulator of cardiac cell function. Depletion of magnesium, as shown in some studies, may be proarrhythmic⁽¹²⁾. According to Tong and Rude, magnesium reduces irregular heartbeat. Because intracellular Mg depletion may be present despite a normal serum Mg, magnesium deficiency must always be considered a potential factor in cardiac dysrhythmias⁽¹³⁾.

Our second case demonstrates that low magnesium and vitamin D level can be responsible for high burden PVCs and medical replacement reduce this burden. Vitamin D deficiency in the healthy Saudi Arabian population is 60% and not 100%, as reported in some studies. An average level of Vitamin D (≥ 30 ng/mL or 75 nmol/l) was seen in 17.83% of the population⁽¹⁴⁾. Many factors influence the levels of Vitamin D other than diet and sunshine. Hussain *et al.* indicated that the prevalence of hypovitaminosis D was more common and severe in Saudis than in non-Saudis living in the same areas and probably eating the same diet. Reports in the literature suggest a strong genetic influence on the circulating Vitamin D levels in different populations⁽¹⁵⁻¹⁶⁻¹⁷⁾. Our Patient was found to have low serum vitamin D and Magnesium levels, most likely secondary to PPI use; she started on oral replacement, and her PVC burden improved from 16 to 7.6 %. The Patient was advised to comply with vitamin D supplements and control her diet with food rich in vitamin D and Magnesium, in addition to avoiding medication that caused gastric irritation.

Conclusion:

Our study demonstrates that PVCs can be treated without intervention and anti-arrhythmic medication by controlling risk factors, managing electrolytes and minerals deficiency that can increase PVCs burden such as vitamin D deficiency, hypomagnesemia, and GERD as its easy and effective way instead of intervention and starting an anti-arrhythmic drug that may cause side effect over the time.

Consent

Written informed consent was obtained from the patient for publication.

Ethical approval

The study was approved by King Abdullah International Medical Research Center (KAIMRC).

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