Why don't they give me something to stop my PVCs?
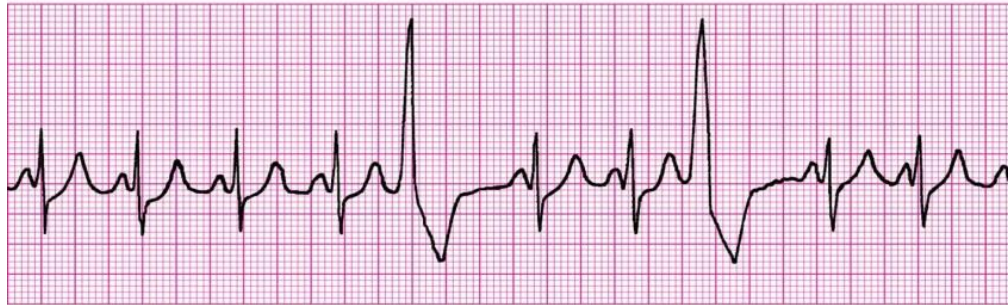
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DISCLOSURES

- There is no conflict of interest and there is nothing to disclose

WHY DO WE TREAT

- How common is it and its impact

- Does the disease effect prognosis

- Does it causes any symptoms

- Does non-pharmacological intervention works

- Does treatment alter the course

Prevalence of PVCs in General population

- PVCs are common and seen in a broad spectrum of the population.

- These are more commonly seen in patients with structural heart disease

- But it is not uncommon to see them in patients without structural heart disease.

Most Frequent Major Abnormalities—Rates/1000*

Diagnosis	16-19	20-24	25-29	30-34	35-39	40-44	45-49	50 & over	Total	Rate per 1,000
Atrial rhythm	14.5 (103)	8.9 (332)	4.6 (101)	2.6 (34)	2.0 (45)	2.9 (54)	0.9 (2)	1.6 (1)	672	5.5
Atrial premature contractions	6.2 (44)	4.8 (181)	4.0 (87)	3.1 (41)	3.9 (86)	4.2 (78)	4.8 (10)	11.5 (7)	534	4.3
Nodal premature contractions	1.6 (12)	2.4 (90)	2.1 (53)	1.2 (16)	1.9 (42)	2.5 (47)	0.4 (1)	2.7 (2)	263	2.1
Ventricular premature contractions	4.6 (33)	6.2 (232)	5.7 (124)	8.3 (108)	8.2 (182)	11.8 (218)	19.0 (39)	21.7 (16)	952	7.8
First-degree AV block	6.0 (43)	7.4 (275)	6.2 (136)	5.0 (65)	5.9 (132)	7.1 (131)	4.8 (10)	13.6 (10)	802	6.5
Wolff-Parkinson-White	1.8 (13)	1.1 (54)	1.9 (42)	2.2 (29)	1.3 (30)	0.9 (17)	0.9 (2)	0 (0)	187	1.5
Right bundle-branch block	0.5 (4)	1.2 (48)	1.3 (29)	2.0 (27)	2.7 (60)	2.9 (54)	1.9 (4)	0.9 (7)	231	1.8
Intraventricular conduction defect	1.9 (14)	4.2 (159)	4.0 (87)	4.2 (55)	4.8 (107)	3.7 (68)	4.8 (10)	6.8 (5)	505	4.1
Ventricular fusion beats	0.4 (3)	0.2 (10)	0.5 (12)	0.6 (8)	0.4 (10)	0.5 (10)	0 (0)	2.7 (2)	55	0.7
Nonspecific T waves	15.1 (107)	9.9 (368)	10.4 (224)	8.9 (114)	12.1 (267)	14.4 (266)	18.1 (37)	29.9 (22)	1405	11.5
AV dissociation with AV nodal rhythm	3.1 (22)	1.3 (49)	0.37 (8)	0 (0)	0.09 (2)	0.17 (3)	0.5 (1)	0 (0)	85	0.7

**Electrocardiographic Findings in 122,043 Individuals
By ROLAND G. AND LAWRENCE E. Circulation 1962; 25:947.**

The prevalence of PVC on a 2 min EKG on middle age adults (45 -65 yrs of age) was approximately 6%

Table I. Age-adjusted prevalence (percent and number) of PVCs on 2-minute ECG, by PVC frequency and morphologic characteristics, ARIC cohort baseline examination, 1987-1989

	Men		Women	
	African American (n = 1542)	**White (n = 5220)**	**African American (n = 2462)**	**White (n = 5846)**
Any PVC	8.2 (127)	6.7 (379)	6.9 (159)	4.7 (275)
Single	3.2 (45)	2.9 (149)	2.9 (63)	1.9 (109)
Frequent	4.4 (65)	3.1 (172)	3.1 (71)	2.5 (141)
Complex	0.9 (17)	1.0 (58)	0.9 (25)	0.5 (25)
Frequent/complex	5.3 (82)	4.0 (230)	4.2 (96)	2.9 (166)

Prevalence is adjusted to age 55 years; single = only one PVC, without R on T PVCs on 2-minute ECG; frequent = 2 or more PVCs, without complex forms; complex = consecutive, multiform or R on T PVCs.

Increasing age, the presence of heart disease, faster sinus rates, African American ethnicity, male sex, lower educational attainment, and lower serum magnesium or potassium levels, as well as presence of HTN are directly related to PVC prevalence.

Prevalence of PVCs on ambulatory monitoring

Table 4—*Ambulatory Monitoring in Normal Subjects*

Author	Year	Age	N	%VA	%SVA	% Complex Arrhythmia*
Hinkle et al[8]	1969**	55	283	62	76	37
Raftery et al[9]	1976	20-79	53	17	23	few
Clarke et al[10]	1976	16-65	86	73	5†	12
Brodsky et al[7]	1977	23-27	50	50	56	24
Present study	1978	60-84	13	100	100	77

*Multiform, couplets, salvoes, R on T, bigeminy, frequent
**Six hour "stress" monitoring
†Supraventricular tachycardia not listed
 N = number
 %VA = percentage with ventricular arrhythmias
 %SVA = percentage with supraventricular arrhythmias

- The prevalence of PVCs is related
    - to the study population,
    - the method used to investigate   and the
    - duration of monitoring/test.

- In patients with no known apparent heart disease, PVCs occur in < 1% on a routine 12-lead ECG

- In 24-hour ambulatory monitoring, >50% of apparently healthy people have occasional PVCs and upto 1-6% had >50 PVC/24 hours

- There is an age-related increase in the prevalence of PVCs in normal individuals and those with underlying heart disease

- The occurrence of frequent PVCs accounting for more than 20 percent of overall heart beats is rare

Conditions associated with more frequent PVCs.

CARDIAC CONDITIONS

- Acute myocardial infarction

- Heart failure/cardiomyopathy

- Myocarditis

- Hypertrophic cardiomyopathy

- Congenital heart disease

- Hypertension with left ventricular hypertrophy

Conditions associated with more frequent PVCs.
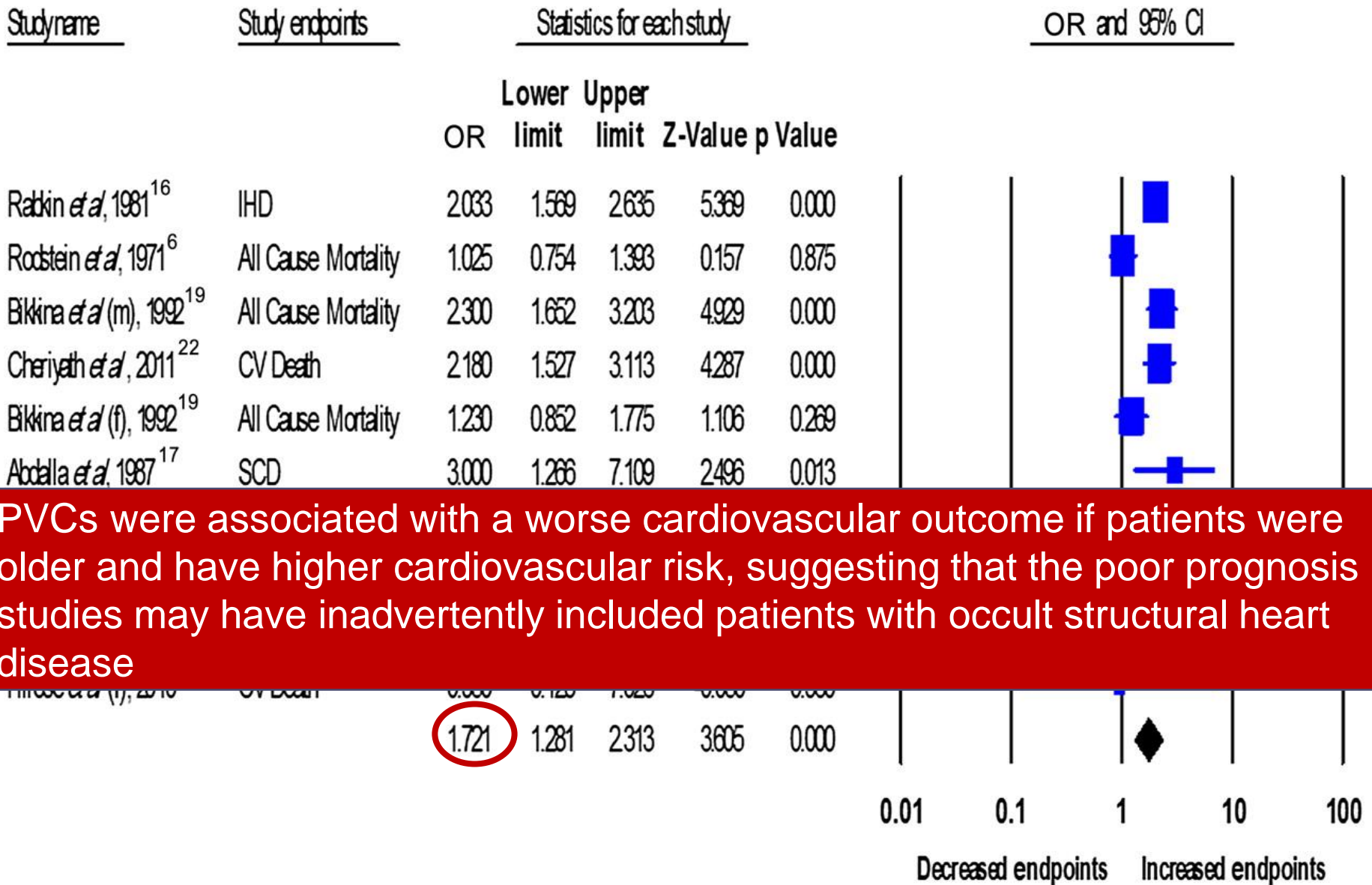
NON-CARDIAC CONDITIONS

- Chronic obstructive pulmonary disease

- Sleep apnea syndromes

- Pulmonary hypertension

- Other pulmonary diseases   and

- endocrinopathies (thyroid, adrenal or gonadal abnormalities).

Triggers to provoke PVCs

- Alcohol

- Tobacco

- Caffeine

- Anemia

- Anxiety

- Exercise

- High blood pressure

- Stimulants, such as sympathomimetic agents (eg, beta-agonists, decongestants, antihistamines)

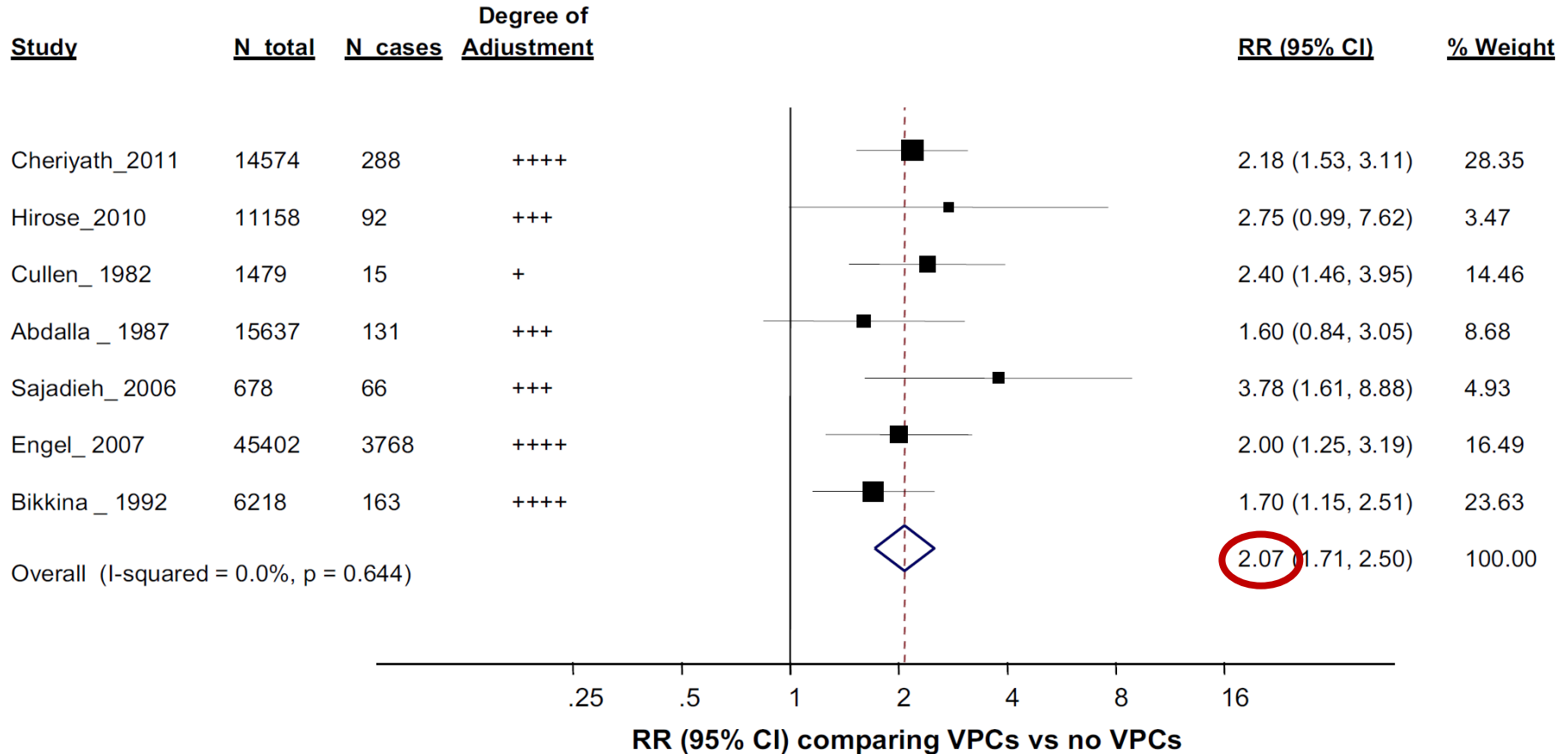- Illicit drugs (eg, cocaine, amphetamines)

PROGNOSIS

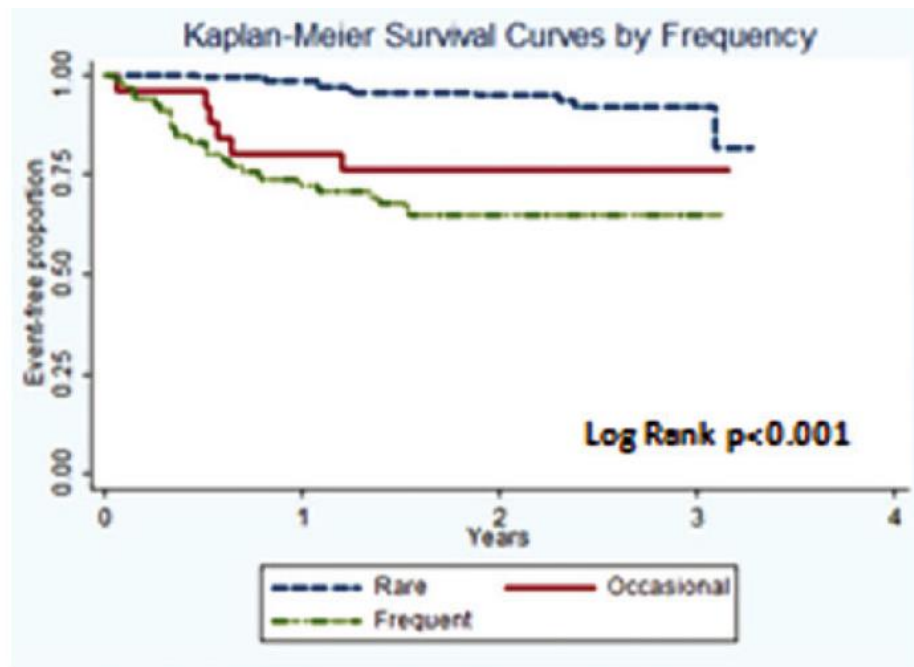| Study name	Study endpoints	Statistics for each study					OR and 95% CI
		OR	Lower limit	Upper limit	Z-Value	p Value	
Rabkin et al, 1981[16]	IHD	2.033	1.569	2.635	5.369	0.000	
Rodstein et al, 1971[6]	All Cause Mortality	1.025	0.754	1.393	0.157	0.875	
Bikkina et al (m), 1992[19]	All Cause Mortality	2.300	1.652	3.203	4.929	0.000	
Cheriyath et al, 2011[22]	CV Death	2.180	1.527	3.113	4.287	0.000	
Bikkina et al (f), 1992[19]	All Cause Mortality	1.230	0.852	1.775	1.106	0.269	
Abdalla et al, 1987[17]	SCD	3.000	1.266	7.109	2.496	0.013	

PVCs were associated with a worse cardiovascular outcome if patients were older and have higher cardiovascular risk, suggesting that the poor prognosis studies may have inadvertently included patients with occult structural heart disease

	CV Death						
		1.721	1.281	2.313	3.605	0.000	

0.01   0.1   1   10   100

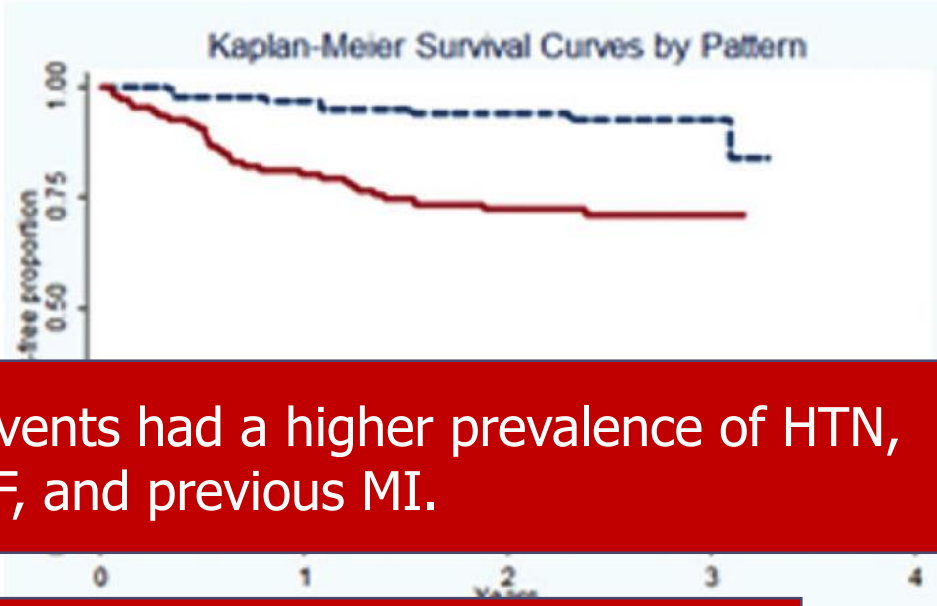Decreased endpoints   Increased endpoints

Association of Frequent PVCs with risk for SCD

Frequent PVCs were defined as occurring ≥ 1 time during a standard electrocardiographic recording or ≥ 30 times over a 1-hour recording.

Study	N_total	N_cases	Degree of Adjustment	RR (95% CI)	% Weight
Cheriyath_2011	14574	288	++++	2.18 (1.53, 3.11)	28.35
Hirose_2010	11158	92	+++	2.75 (0.99, 7.62)	3.47
Cullen_ 1982	1479	15	+	2.40 (1.46, 3.95)	14.46
Abdalla _ 1987	15637	131	+++	1.60 (0.84, 3.05)	8.68
Sajadieh_ 2006	678	66	+++	3.78 (1.61, 8.88)	4.93
Engel_ 2007	45402	3768	++++	2.00 (1.25, 3.19)	16.49
Bikkina _ 1992	6218	163	++++	1.70 (1.15, 2.51)	23.63
Overall (I-squared = 0.0%, p = 0.644)				2.07 (1.71, 2.50)	100.00

RR (95% CI) comparing VPCs vs no VPCs

Kaplan-Meier Survival Curves by Frequency

Log Rank p<0.001

Rare ------- < 5 PVCs/hour
Occasional ------ 5–10 PVCs/hour
Frequent ------> 10 PVCs/hour

Kaplan-Meier Survival Curves by Pattern

Patients with adverse cardiovascular events had a higher prevalence of HTN, diabetes, CAD, CHF, and previous MI.

In Cox regression analyses, only the multiform pattern but not frequency predicted Adverse Events.

PROGNOSIS

- Though, traditionally, PVCs are often thought to be of minimal clinical significance, particularly in patients without a history of cardiac disease, most studies have reported an increased mortality in patients with PVCs, especially with frequent and complex PVCs in general population.

- But, these studies, though, were done in adults without clinically apparent heart disease, but *most studies did not use advanced tests to rule out structural heart disease.*

PROGNOSIS

- **The 5 uncontrolled studies which studied patients with lower cardiovascular risk and has a high usage of echocardiography and stress test, observe zero mortality, SCD, VT or syncope events in their PVC cohort over an average of 6.9 years.**

- This may suggest that the poor prognosis may be secondary to inadvertent inclusion of patients with occult structural heart disease, the population in which PVCs are known to confer adverse outcomes

High Risk PVCs

- Multifocal PVCs

- Two consecutive PVCs (couplets)

- Three or more consecutive PVCs (salvos/non-sustained ventricular tachycardia)

- "R-on-T" phenomenon

- These high grade PVCs are more commonly seen in advanced form of underlying cardiac disease, which has worse prognosis.

- This suggest that, high grade PVCs are just the marker of more advanced disease and *it is not the PVCs, but the severity of the disease which is related to the prognosis and worse outcomes*

- As such, the presence of significant PVCs should alert the clinician to potential coexistent cardiac disease, which may require additional clinical assessment or therapy

Symptoms

- Most patients are asymptomatic

- The most common symptom is palpitations

- Rarely, PVCs can result in hemodynamic compromise, causing symptoms of dizziness, presyncope and decrease in exercise capacity

  - When they occur frequently in a patient with severely depressed left ventricular function   or

  - When they are associated with an underlying bradycardia

  - When they are extremely frequent

- Extremely frequent PVCs (typically > 15-20% of all beats) can result in a reversible cardiomyopathy, even in the absence of sustained ventricular arrhythmias or symptoms

- This effect is most pronounced in younger patients without comorbidities, suggesting that PVCs may be an important cause of "idiopathic" HF.

- Elimination of PVCs using catheter ablation or medications often leads to normalization of cardiac function

IMPACT OF TREATMENT TO SUPRESS PVCs
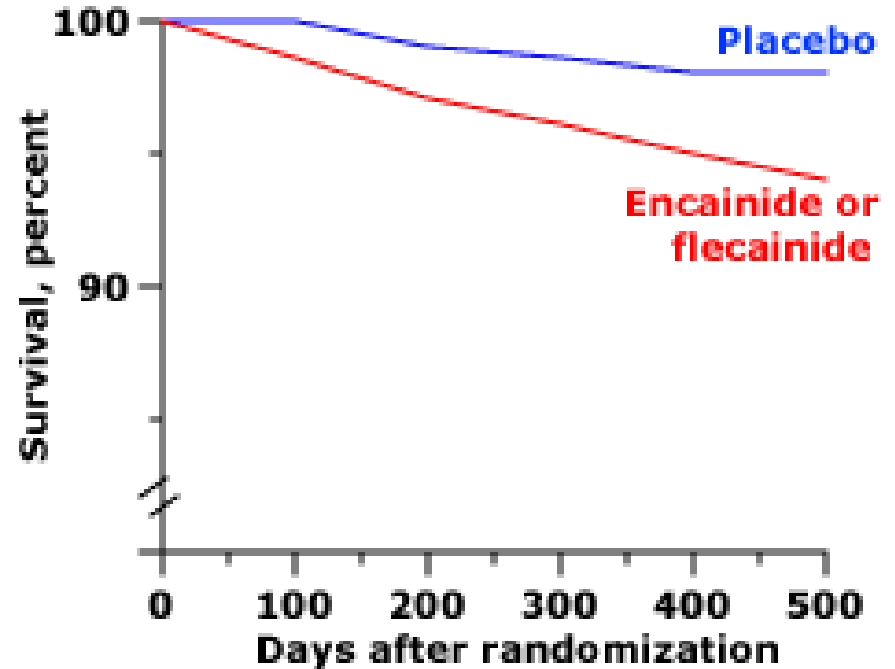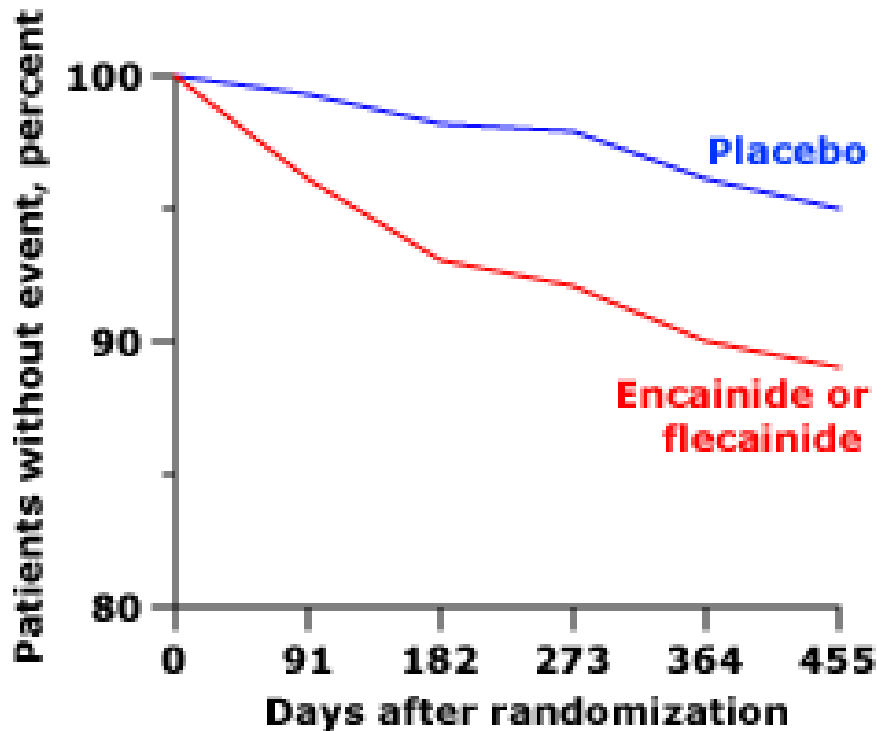
Results of the Cardiac Arrhythmia Suppression Trial (CAST) in patients with ventricular premature beats after myocardial infarction. Patients receiving encainide or flecainide had, when compared with those receiving placebo, a significantly lower rate of avoiding a cardiac event (death or resuscitated cardiac arrest) (left panel, p = 0.001) and a lower overall survival (right panel, p = 0.0006). The cause of death was arrhythmia or cardiac arrest.

Echt DS, Liebson PR, Mitchell B, et al. N Engl J Med 1991; 324:781.
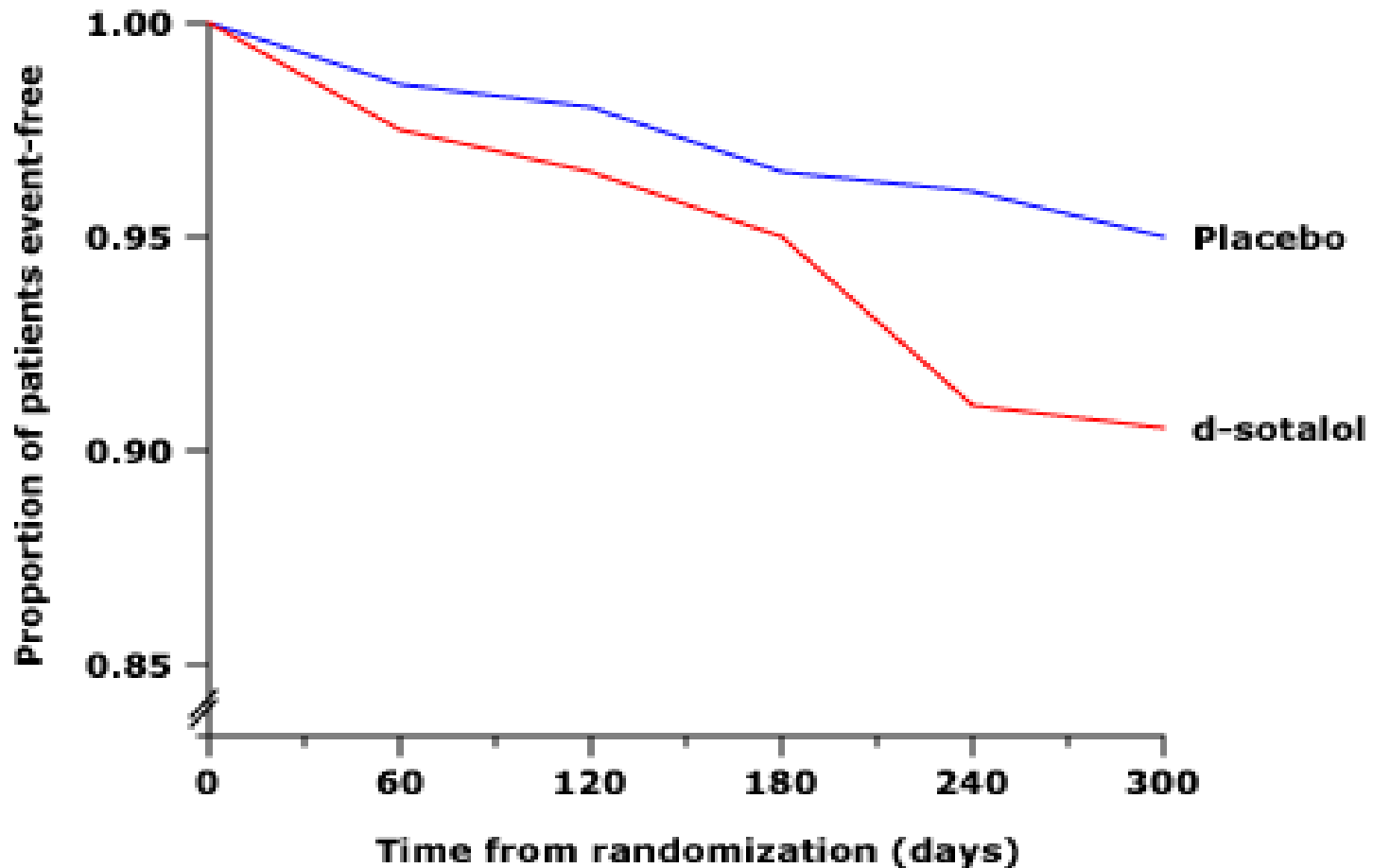
Results from the Survival With Oral d-Sotalol (SWORD) trial. The administration of d-sotalol to patients with an ejection fraction ≤40 percent after either recent myocardial infarction (MI) or after symptomatic heart failure with a remote (>42 days) MI was associated with increased mortality compared with placebo (5 versus 3.1 percent). The excess number of deaths was presumed to be primarily due to arrhythmias.

Waldo AL, Camm AJ, DeRuyter H, et al. Lancet 1996; 348:7.
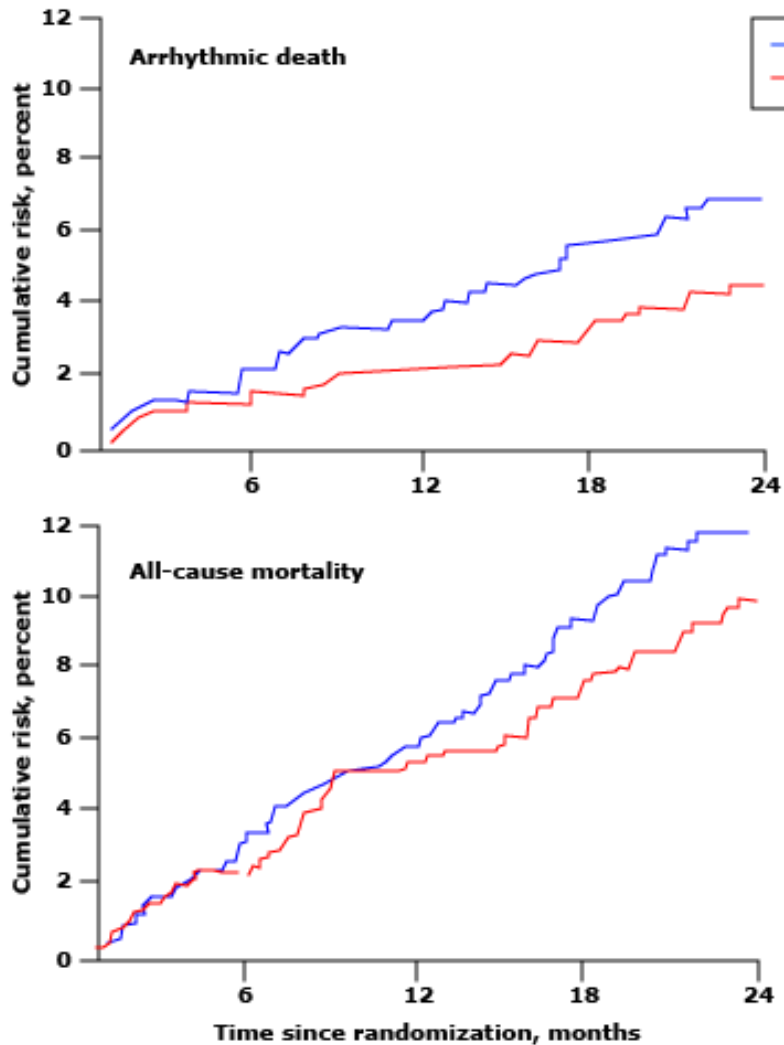
Effect of amiodarone versus placebo in 1202 postmyocardial infarction patients with PVCs in the CAMIAT trial. By an intention to treat analysis, amiodarone produced a significant reduction in arrhythmic death (top panel, $p = 0.016$) but no change in all-cause mortality (bottom panel).

Cairns JA, Connolly SJ, Gent M, et al. Lancet 1997; 349:675.

IMPACT OF TREATMENT TO SUPRESS PVCs

- ***Thus, there is no clear evidence that suppression of PVCs with beta blockers, calcium channel blockers or antiarrhythmic drugs improves overall survival in patients who have no symptoms and have not had a major arrhythmic event.***

- This is especially true in patients without any structural heart disease

- This also holds true for most of the cases with underlying structural heart disease, except for few exceptions

- Beta blockers does improve survival in patients with a large prior myocardial infarction (MI) or heart failure (HF), but this benefit is irrespective of PVCs

APPROACH TO PATIENT WITH PVCs

In patients with *frequent and unexplained PVCs*, the following evaluation should be performed:

- **Thorough history and physical exam**
  - To assess for any underlying structural heart disease (HTN, Ischemic heart disease, CHF, valve disease)
  - With documented nocturnal PVCs, patient should be assessed for sleep apnea
  - History of use of triggers like alcohol or caffeine-containing beverages, or illicit drugs, or use of other stimulants etc
  - For family history of sudden cardiac death and cardiomyopathy

- **Laboratory testing**
  - Electrolyte levels,
  - Thyroid stimulating hormone [TSH]

- **EKG**

  - Any evidence of Previous MI
  - Conduction abnormalities
  - LVH
  - Significant repolarization changes

- **24-hour ambulatory (Holter) monitor**

  - To quantify the frequency of PVCs
  - Any sustained or non-sustained VT
  - To determine the morphology of PVCs (if they are monomorphic or polymorphic)

- **Echocardiography**

  - If history suggestive of cardiac disease or there are frequent or complex PVCs, echo should be performed to assess cardiac structure and function

- **Exercise treadmill stress test**

  - To evaluate the response of the PVCs to exercise
  - To determine if sustained or non-sustained ventricular tachycardia (VT) can be induced with exercise
  - To screen for underlying ischemic heart disease

TREATMENT

- In persons found to have frequent PVCs, further management is based on the

    - **_presence or absence of underlying structural heart disease_**

                            and/or

    - **_symptoms_**

In absence of structural heart disease, with no obvious drug and metabolic cause

- **In Patients with low grade ectopy (including bigeminy) and low to modest PVCs burden**

    - **Avoiding exposure** to possible triggers should be advised, although this strategy has not been a consistently effective

    - **Reassurance** regarding the benign nature PVCs

    - **Regular follow-up by family MD**

    - If still symptomatic, then treatment with **a beta-blocker and/or a non-dihydropyridine calcium channel blocker (Verapamil or Diltiazem)** should be initiated

- Thus, the only indications for the use of beta blockers or antiarrhythmic drugs for PVCs suppression are for symptomatic patients or for patients with cardiomyopathy felt to be possibly related to frequent PVCs.

- **Beta blockers** tends to suppress PVCs due to excess sympathetic stimulation or increased catecholamines

- In other conditions, it may not reduce frequency, but may reduce symptoms.

- The lowest dose of beta blockers that relieves symptoms should be used in order to minimize side effects, with the exception of patients with a prior MI or LV dysfunction

In absence of structural heart disease

- **Consider Cardiology referral**

    - If still symptomatic after treatment and reassurance

    - Unable to tolerate beta-blocker and/or a calcium channel blocker

    - If frequent and complex ventricular ectopy

    - Patient with a very high burden of PVCs (generally >20% of beats or >10,000 PVCs/24 hours) should also be **referred earlier to cardiology** because of risk of developing cardiomyopathy

In patients with pre-existing/or newly diagnosed cardiac disease

- Patient should be **adequately treated for his underlying cardiac disease** (eg. beta blockers, ACEi, diuretics for CHF, good control of BP with hypertension)

- What is the **cardiac function** (LVEF > 50%, LVEF < 40%

- Consider treatment with **beta blockers**

- Consider **early cardiology referral** for complete assessment of cardiac status and to be assessed for possible treatment with antiarrhythmic therapy and catheter ablation

CONCLUSION

- PVCs are one of the most common arrythmia

- Most patients with PVCs are asymptomatic or minimally symptomatic

- Current belief is, that presence of PVCs in itself does not affect survival.

- Treating PVCs with any of the drugs have not shown to improve survival

- Complex and frequent PVCs may be a marker of underlying disease and it is the underlying disease which affects survival

- **Thus, PVCs should be evaluated in context of company it keeps**

  - ***In absence of any structural heart disease***, the only indication to treat will be symptoms control, otherwise reassurance and routine clinical follow-up

  - ***In presence of heart disease***, the most important management is adequate treatment of underlying disease
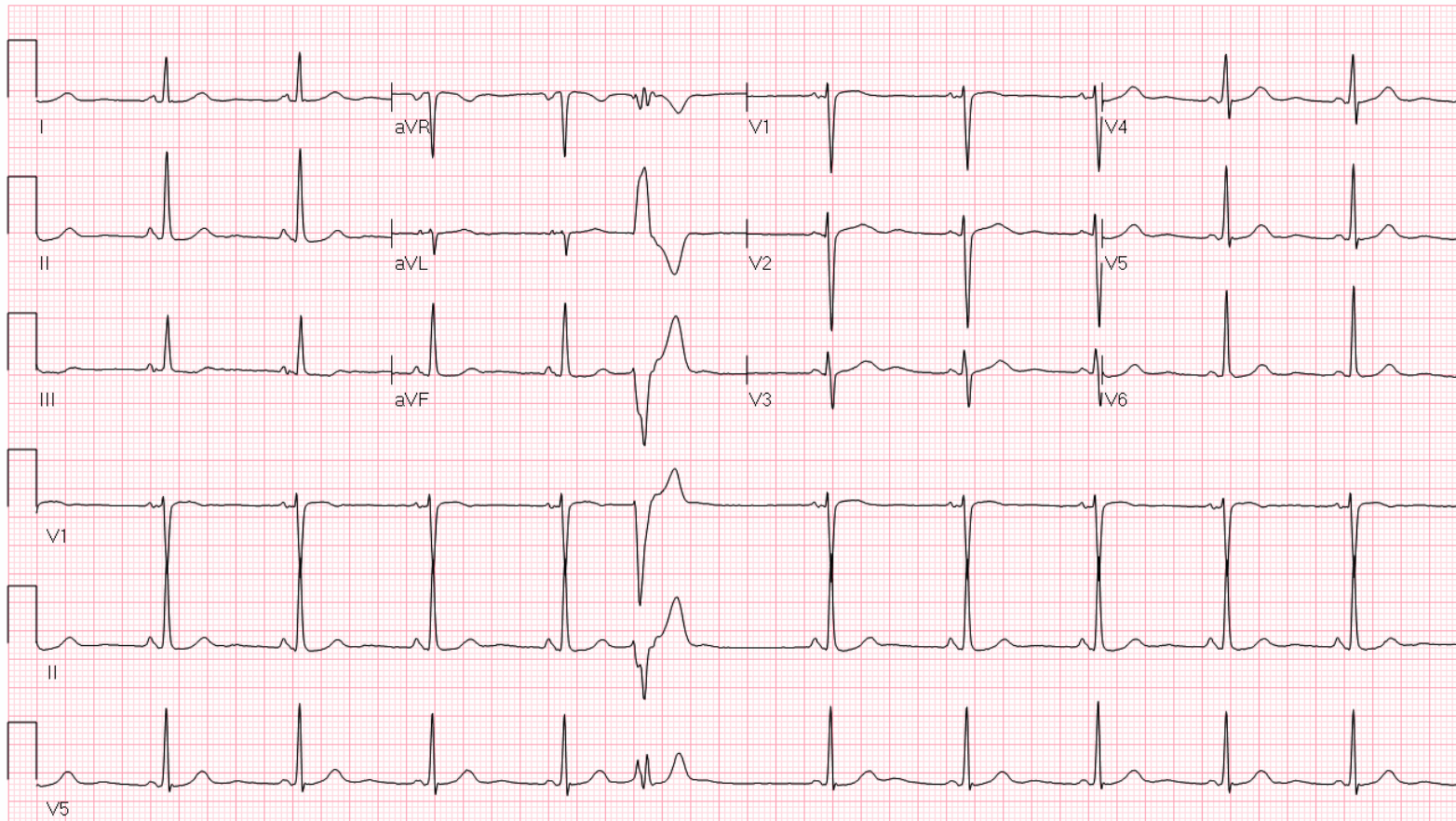
- 50 yr old
- Hx of HTN, DM and Hx of MI 4 years ago
- Feels intermittently light headed
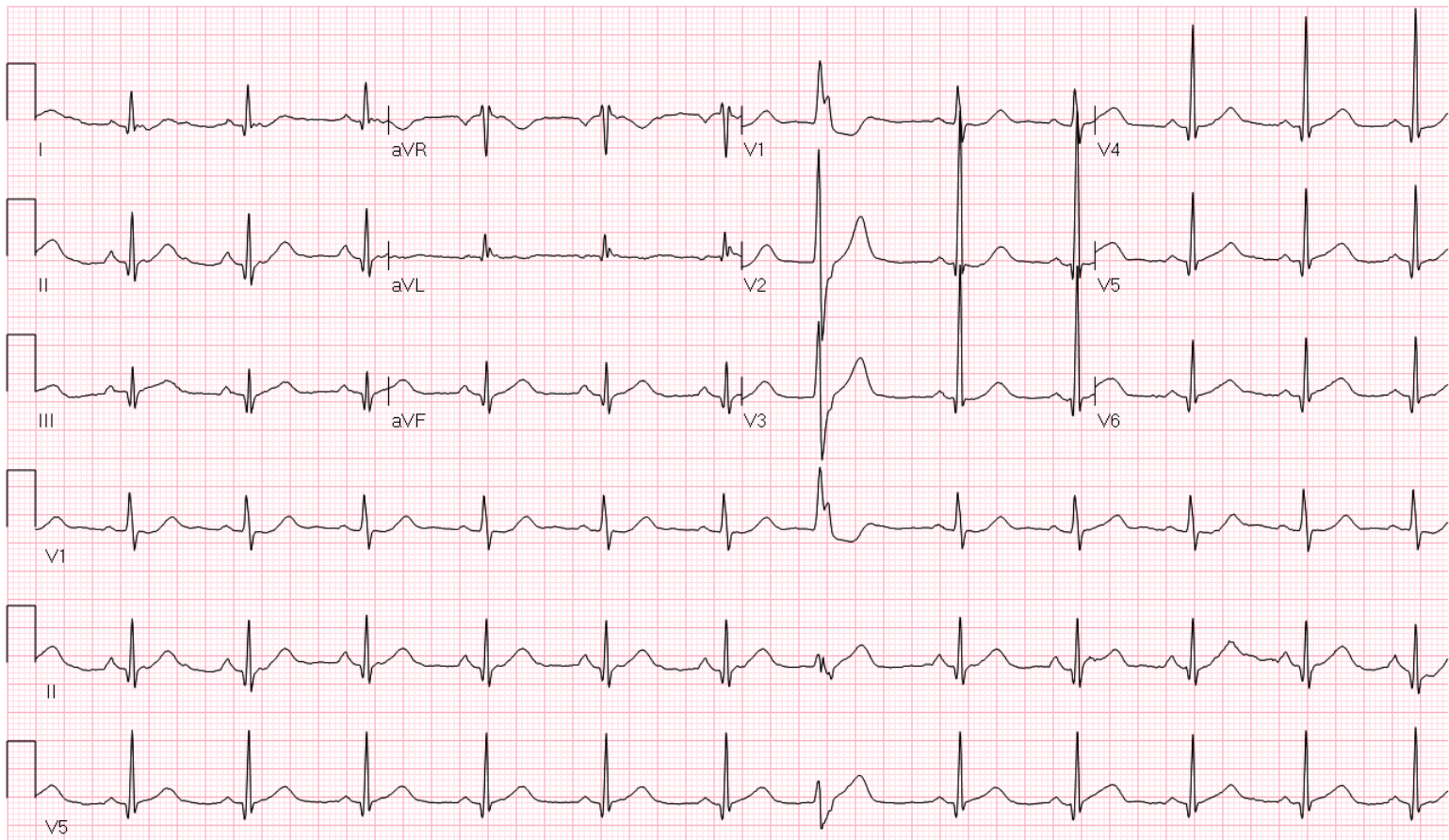
- 37 yr old
- No significant PMH
- Family Hx of sudden cardiac death (Father died suddenly at age of 43)
- Complaining of palpitation
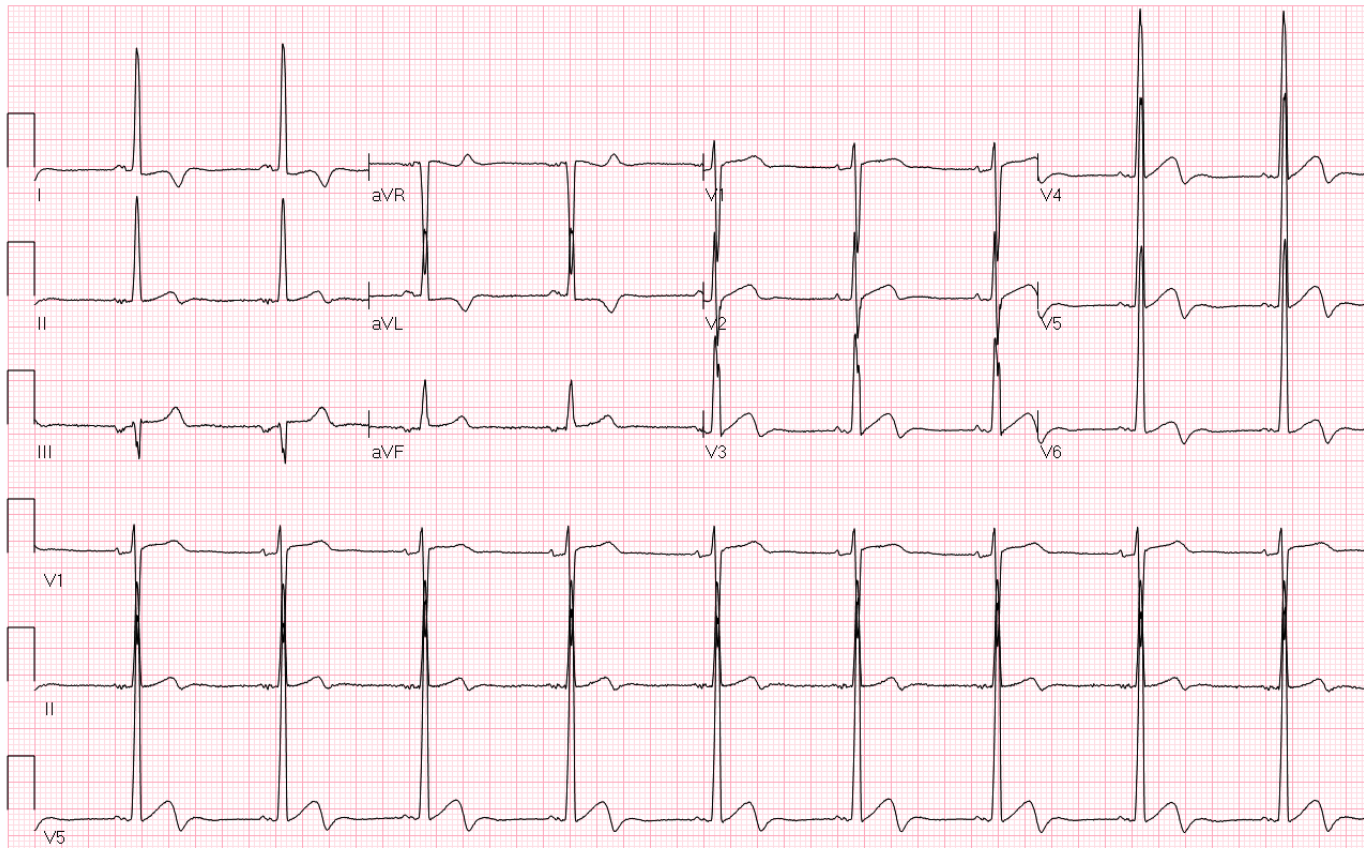
- 58yr old
- No PMH
- Healthy active gentleman
- Routine EKG

Thank you