

Long QT Syndrome

Case Oriented Approach

2005

LQT & TDP

LQTS and TdP

- 48/F
- C/C: Dizziness and chest discomfort for 3 years
- Past Hx: 2003, diagnosed as chronic hepatitis B
- H/X:
 - 2001, 2003, Sudden palpitation and headache, cold sweating, chest pain without LOC
 - Above symptom attack one time in 2 months before
 - 2005, 3, 26. Same symptom developed.
 - 2005, 3, 30 admission: LQT, VPC bigeminy → CCU
 - 2nd day of admission; 8 am. seizure attack like episode, patient didn't remember

Name: ID: Room: years cm kg / mmHg Med.:

Atrial rhythm
Twave abnormality, consistent with anterolateral ischemia
Twave abnormality, possible inferior ischemia
Moderate right axis deviation
ARTIFACT PRESENT
** abnormal ECG **

Vent. rate 88bpm
PR int. 128ms
QRS dur. 80ms
QT/QTc int. 436/482ms
P/QRS/T axis 179/ 92/ 244°
RV5/SV1 amp. 1.94/1.58mV

Admission day 4PM

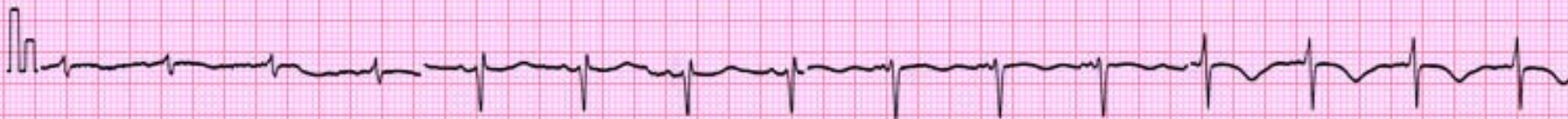
Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF
I-II-III

aVR-aVL-aVF

5mm/mV (Auto)
VI-V2-V3

V4-V5-V6

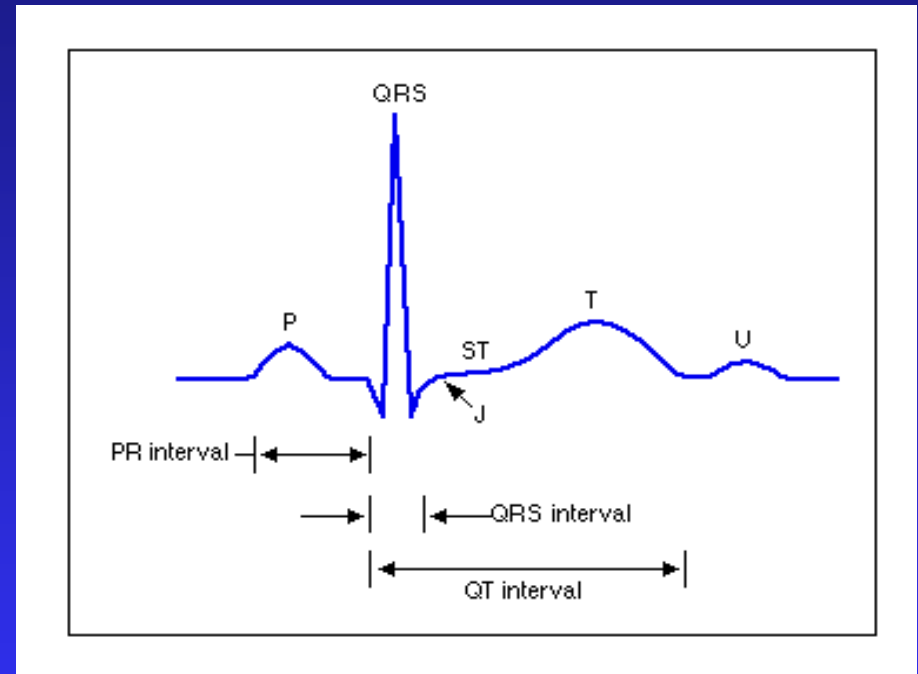


Rhythm[11] 10mm/mV



ECG Findings in LQTS

- QT interval should be measured from the onset of Q wave to the end of T wave in an ECG leads, usually lead II.
- $QTc = QT / RR$
- QTc prolonged
Men > 0.45 s
Women > 0.46 s



LQTS Diagnostic Criteria

Electrocardiographic Finding	Points	Clinical History	Points
– QTc		– Syncope	
>480 ms	3	With stress	2
460-470 ms	2	Without stress	1
450 (male) ms	1	– Congenital deafness	0.5
– Torsade de pointes	2	Family History	
– T wave alternans	1	– (+) family Hx of LQTS	1
– Notched T wave in 3 leads	1	– Unexplained sudden death < 30	0.5
– Low heart rate for age	0.5		

<2 points: low probability

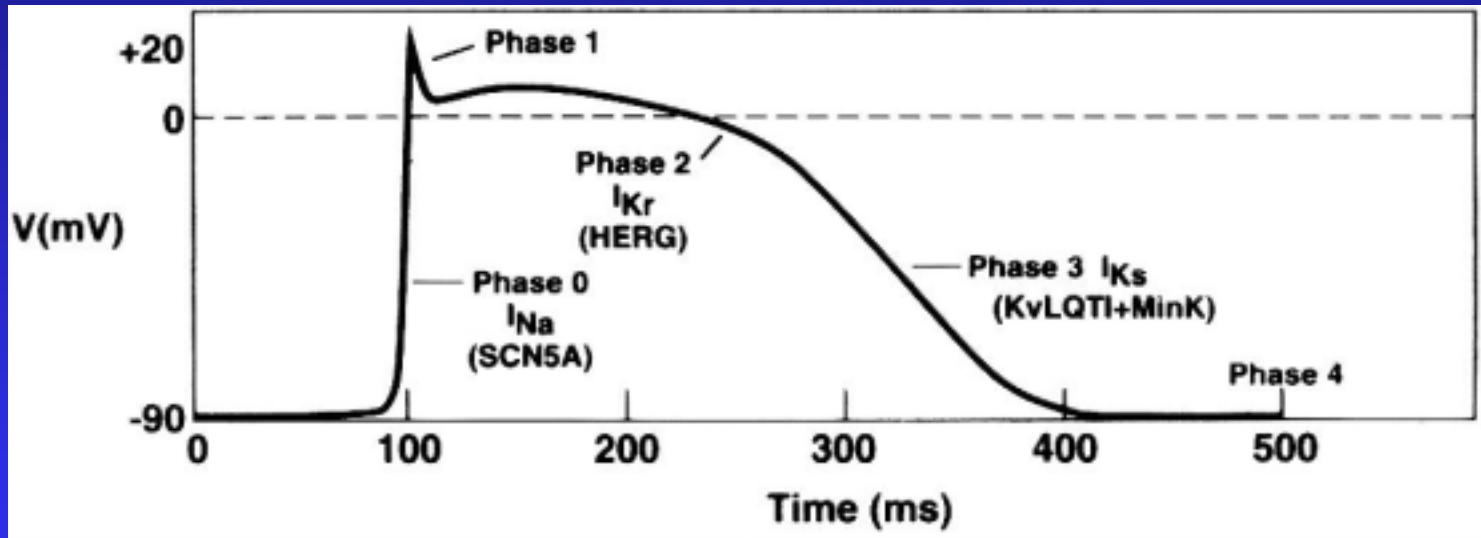
2 to 3 points: intermediate probability

>4 points: high probability of LQTS

Molecular Genetics of LQTS

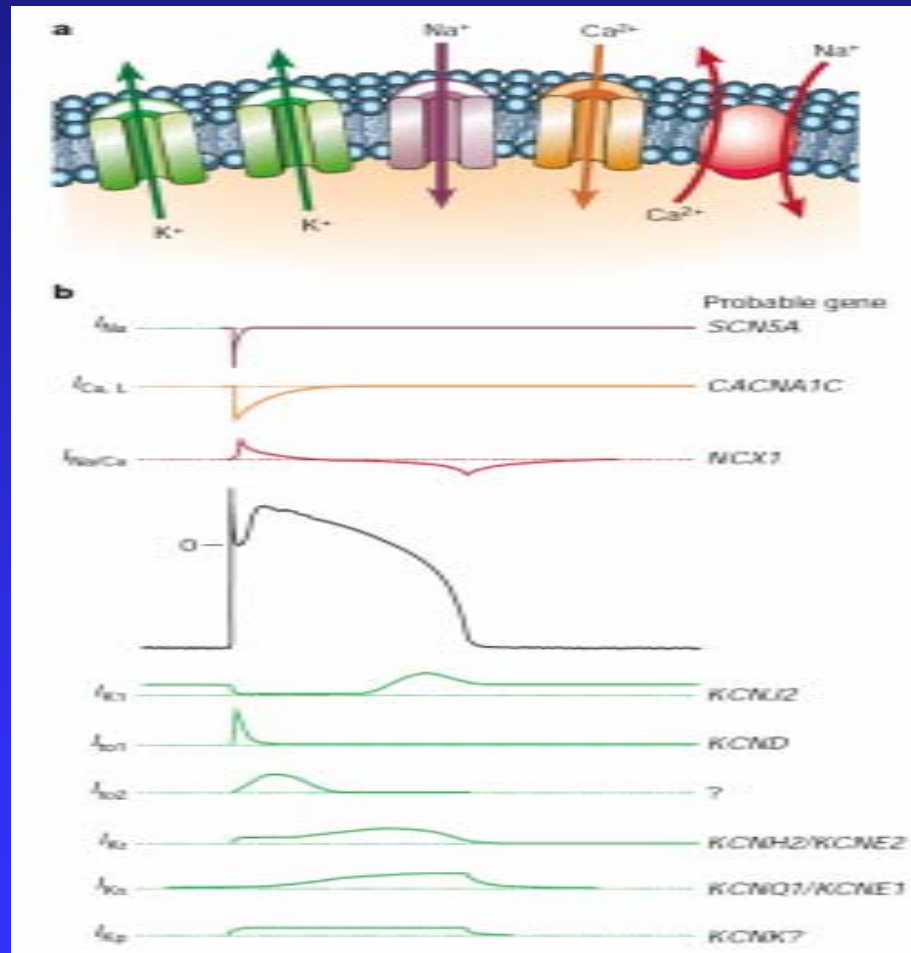
LQTS Type (Years Discovered)	Chromosomal Locus	Mutant Gene (Alternate Name)	Ion Currents	Frequency
LQT1(1991)	11p15.5	<i>KCNQ1 (KVLQT1)</i>	I_{Ks}	~ 50%
LQT2 (1994)	7q35-36	HERG	I_{Kr}	30-40%
LQT3 (1994)	3q21-24	SCN5A	Increased Na ⁺ current (I_{Na})	5-10%
LQT4 (1995)	4q25-27	Ankyrin B	Possibly increased late Na ⁺ current (I_{Na})	rare
LQT5 (1997)	21q22.1-22.2	<i>KCNE1 (minK)</i>	I_{Ks}	rare
LQT6 (1999)	21q22.1-22.2	<i>KCNE2 (MiRP1)</i>	I_{Kr}	rare
LQT7 (2001)	17q23	<i>KCNJ2</i>	I_{K1}	rare

Moss AJ et al. JAMA; 2003, 289: 2041-2044



Towbin: Am J Med, 2001: 110 0(5)..385-398

Ion Channels Underlie Cardiac Excitability



Marbán E. Nature 2002, 415, 213-218

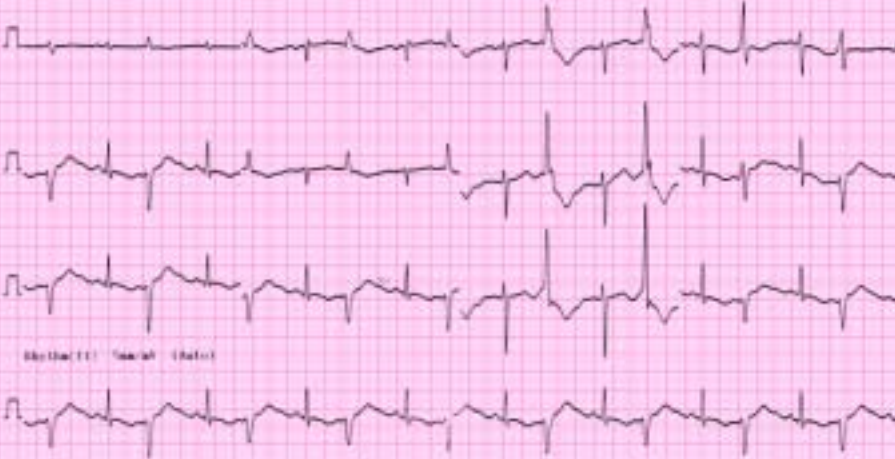
Day of Admission, 10 PM

Day of admission 11 PM

Name: _____ Date: Nov. 10, 2005 10:52pm
 ID: _____ Sex: _____ Race: _____
 HR: 44 RR: 16 SpO2: 98%
 Med.: _____
 Lead: Rate 112bpm
 PR Int. 120ms
 QRS Dur. 86ms
 QT/QTc Int. 386/455ms
 P/QRS/T axis 45/ 71/ 20°
 QRS/ST amp. 1.36/1.86mV
 Interpretation:
 Sinus bradycardia
 with frequent ventricular premature complexes in a pattern of bigeminy
 T wave abnormality, possible inferior/lateral ischemia
 T wave abnormality, possible inferior ischemia
 Moderate right axis deviation
 ST/T ABNORMAL
 ** abnormal ECG **

Unconfirmed Report Received by:

Sam/W (Aetol) 25m/s, Filter OFF 488-490, 497
 1-11-05
 Sam/W (Aetol) 25m/s, Filter OFF 488-490, 497
 11-02-05
 SA-95-06



Name: _____ Date: _____
 ID: _____ Sex: _____ Race: _____
 HR: 44 RR: 16 SpO2: 98%
 Med.: _____
 Lead: Rate 112bpm
 PR Int. 120ms
 QRS Dur. 86ms
 QT/QTc Int. 386/455ms
 P/QRS/T axis 45/ 71/ 20°
 QRS/ST amp. 1.36/1.86mV
 Interpretation:
 Sinus bradycardia
 with frequent ectopic premature complexes
 Left ventricular hypertrophy with repolarization abnormality
 ST/T ABNORMAL
 ** abnormal ECG **

Unconfirmed Report Received by:

Sam/W (Aetol) 25m/s, Filter OFF 488-490, 497
 1-11-05
 Sam/W (Aetol) 25m/s, Filter OFF 488-490, 497
 11-02-05
 SA-95-06



Name: ID: Room: years kg / mhg Med.:

Sinus rhythm Short PR interval Twave abnormality, consistent with anterolateral ischemia Twave abnormality, possible inferior ischemia Minimal voltage criteria for LVH, may be normal variant ** abnormal ECG **

Vent. Rate 74bpm PR int. 108ms QRS dur. 88ms QT/QTc int. 552/579ms P/QRS/T axis 4/ 81/ 247° RV5/SV1 amp. 2.19/1.85mV

2nd day of admission 6AM

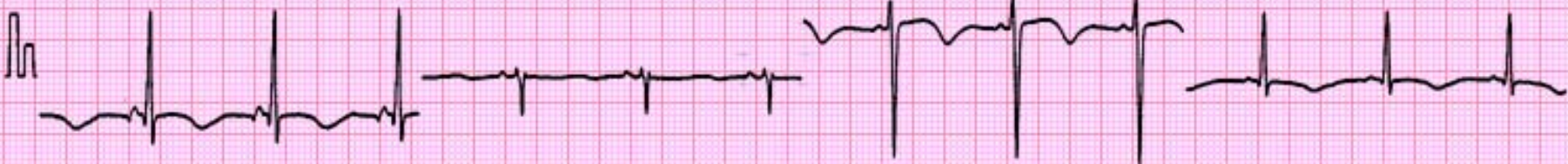
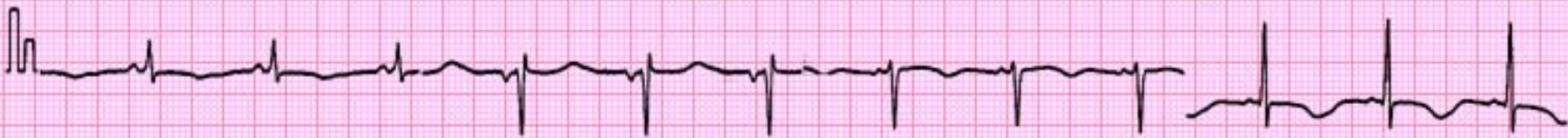
Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF I-II-III

aVR-aVL-aVF

5mm/mV (Auto) V1-V2-V3

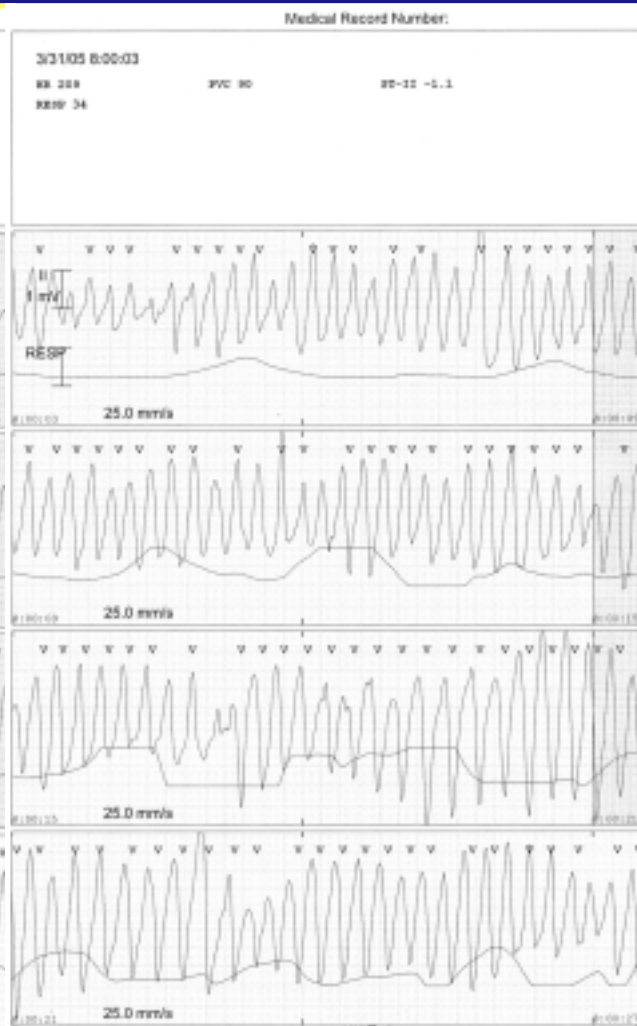
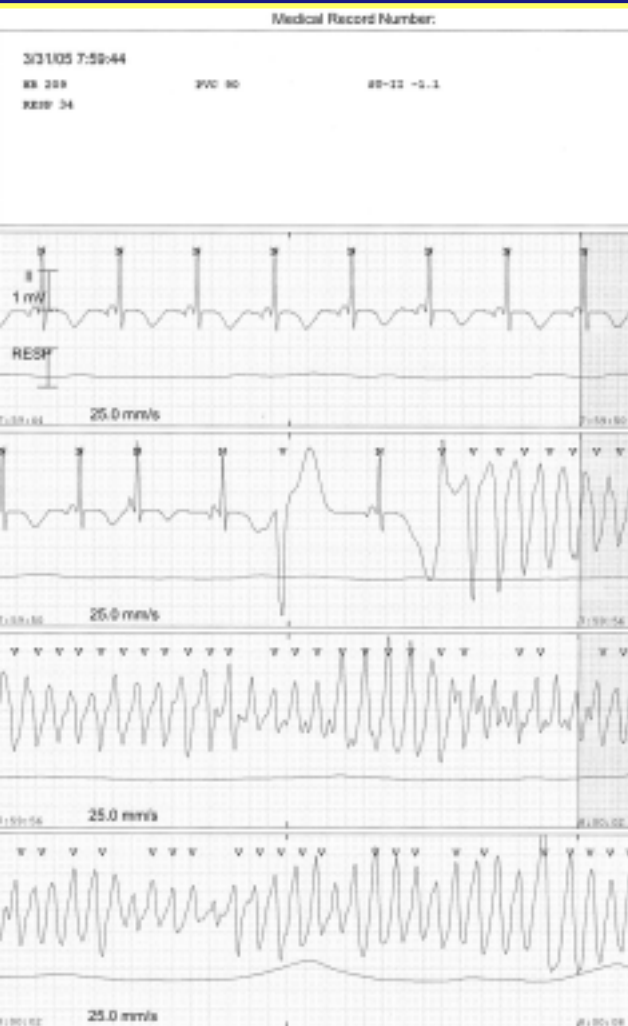
V4-V5-V6



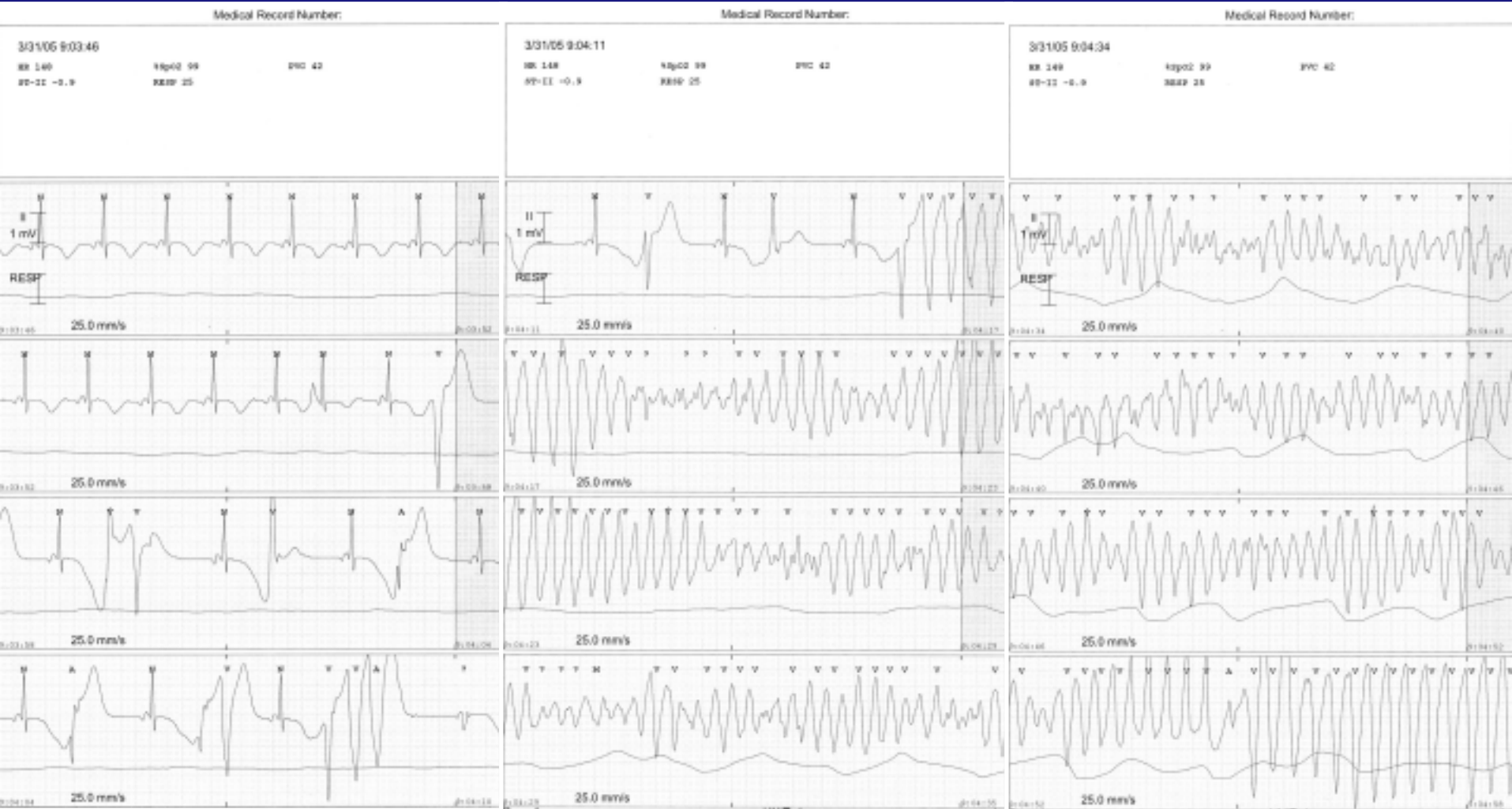
Rhythm[II] 10mm/mV



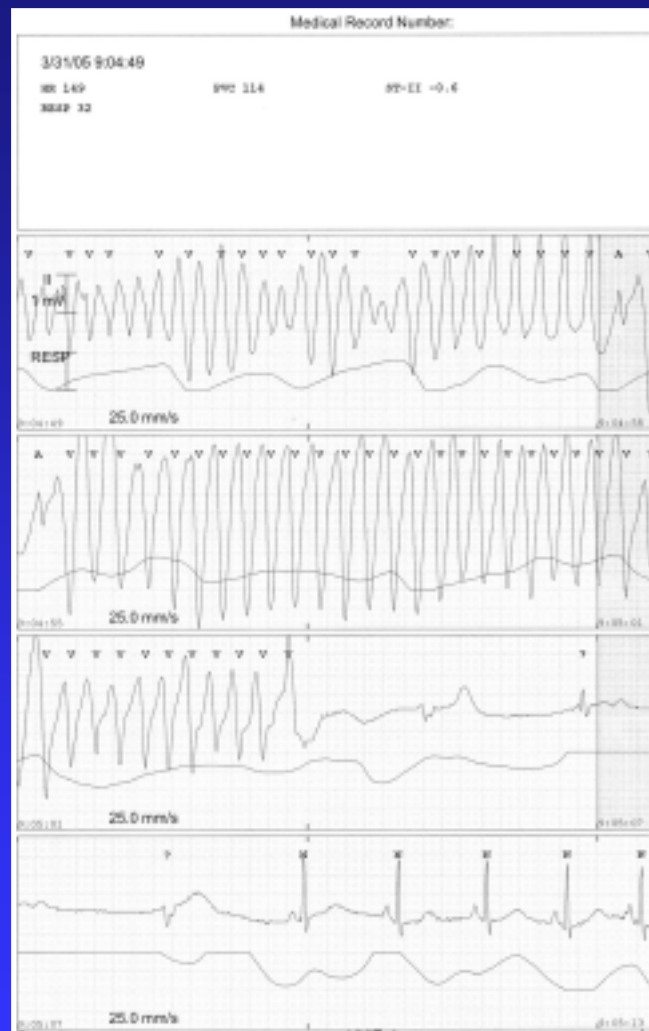
2nd day of admission, 8 am



2nd day of admission 9 am



2nd day of admission 9 am



2nd day of admission, 10AM

Mar. 31, 2005 10:17am

Name:

ID:

Room:

cm years

kg

/ mmHg

Med.:

Atrial rhythm

Short PR interval

Twave abnormality, consistent with anterolateral ischemia

Twave abnormality, possible inferior ischemia

** abnormal ECG **

Vent. Rate 75bpm

PR int. 96ms

QRS dur. 84ms

QT/QTc int. 576/605ms

P/QRS/T axis -42/ -81/ 203°

RV5/SV1 amp. 2.22/1.45mV

Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF

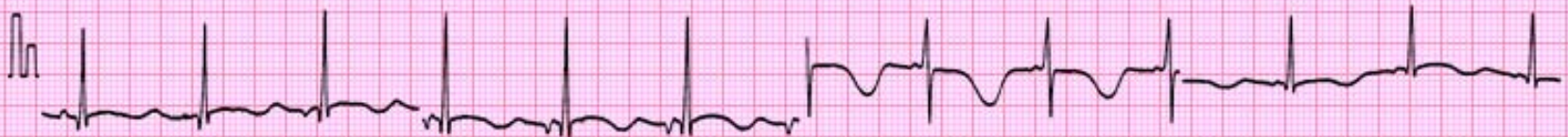
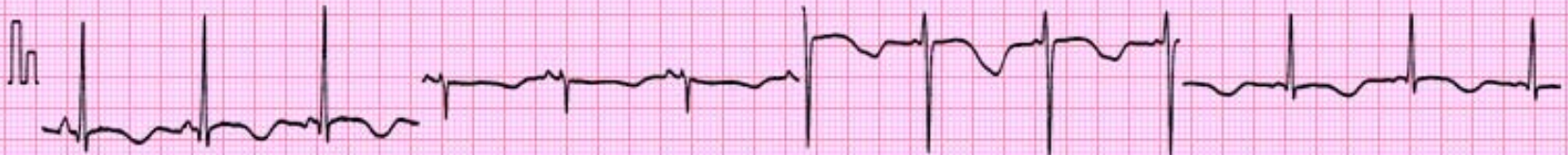
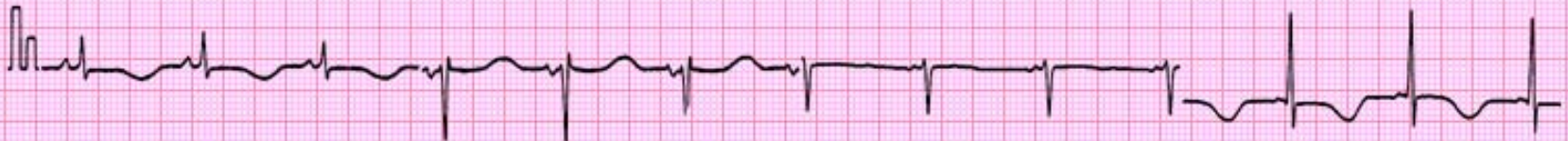
I-II-III

aVR-aVL-aVF

5mm/mV (Auto)

V1-V2-V3

V4-V5-V6



Rhythm(11) 10mm/mV



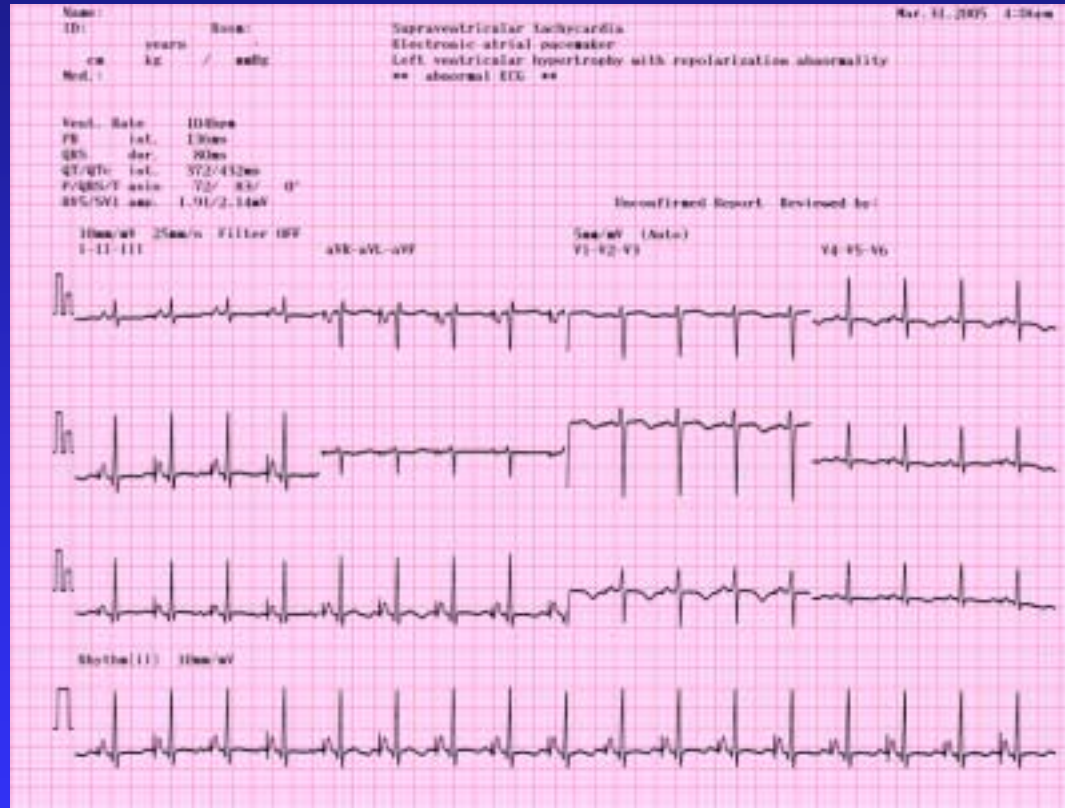
Re Dr Name:

Tech Name:

Short Term Management

- IV magnesium sulfate
- Temporary transvenous cardiac pacing,
- Rarely, administration of IV isoproterenol.
- Correction of electrolyte abnormalities and withdrawal of offending agents.

Post temporary pacemaker insertion & Overdrive pacing



Korean ICD indication for LQTS

- Long QT syndrome
 가(evaluation)



ICD Indication

- 가
-
-
- 가(evaluation)
(EPS)
- 가
- 가 ,
(1) 30% low EF
(2)
(3) (EPS)

Propranolol 20 mg tid and temporary pacemaker removed

Name:
ID: Room:
 years
 cm kg / mmHg
Med.:

Sinus rhythm
Twave abnormality, consistent with anterolateral ischemia
Twave abnormality, possible inferior ischemia
** abnormal ECG **

Apr. 4.2005 10:53pm

Vent. Rate 52bpm
PR int. 124ms
QRS dur. 88ms
QT/QTc int. 432/498ms
P/QRS/T axis 54/ 88/ 219°
RV5/SV1 amp. 1.52/1.50mV

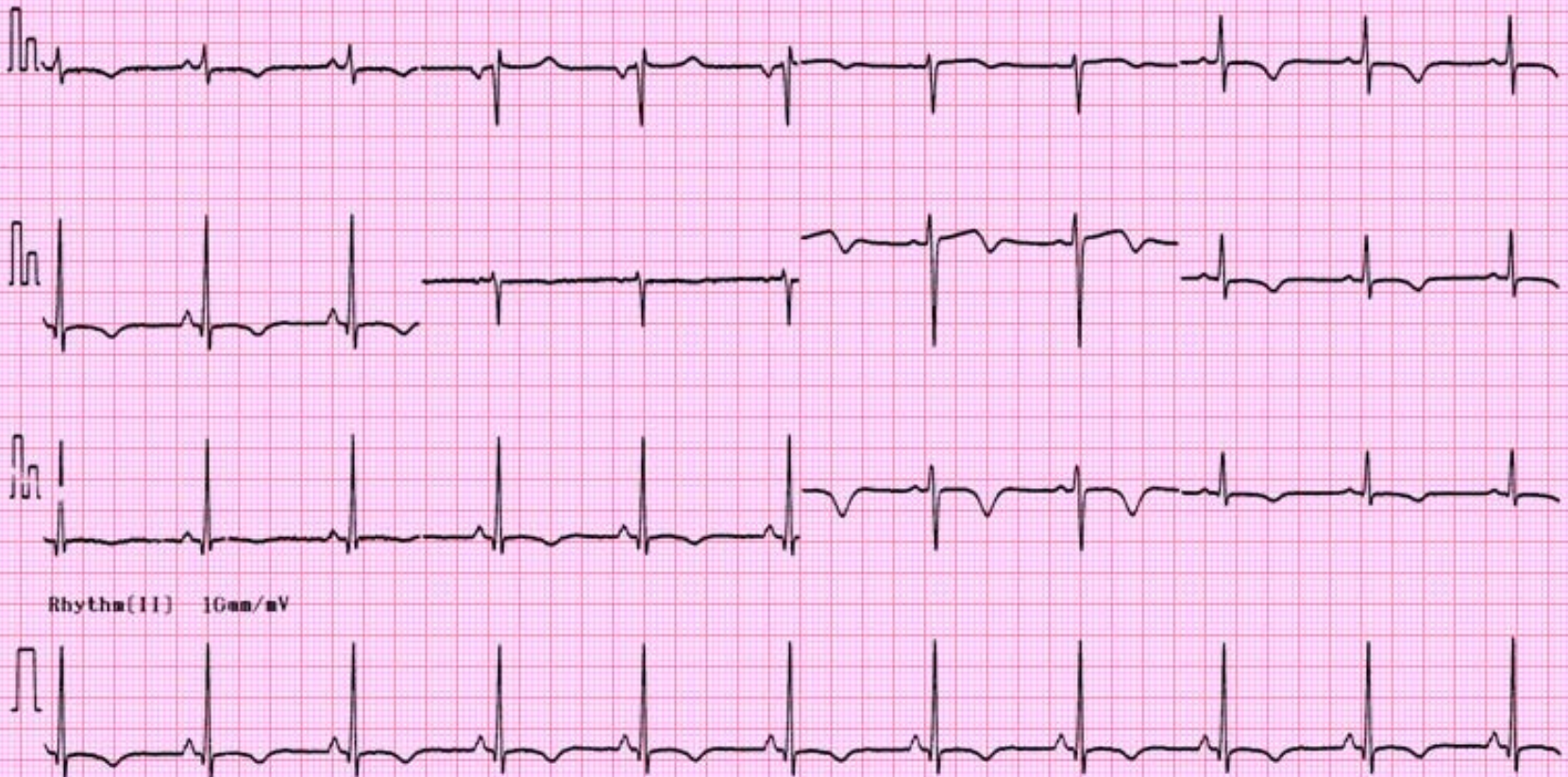
Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF
I-II-III

aVR-aVL-aVF

5mm/mV (Auto)
V1-V2-V3

V4-V5-V6



April. 9. 9 am, the day of cardiac arrest

Apr. 9, 2005 5:52am

Name:

ID:

Room:

cm years
kg / mmHg

Med.:

Sinus rhythm

T-wave abnormality, consistent with anterolateral ischemia

T-wave abnormality, possible inferior ischemia

Moderate right axis deviation

ARTIFACT PRESENT

** abnormal F **

Vent. Rate 62bpm
PR int. 128ms
QRS dur. 88ms
QT/QTc int. 516/521ms
P/QRS/T axis 63/ -91/ 251°
RV5/SV1 amp. 1.52/1.43mV

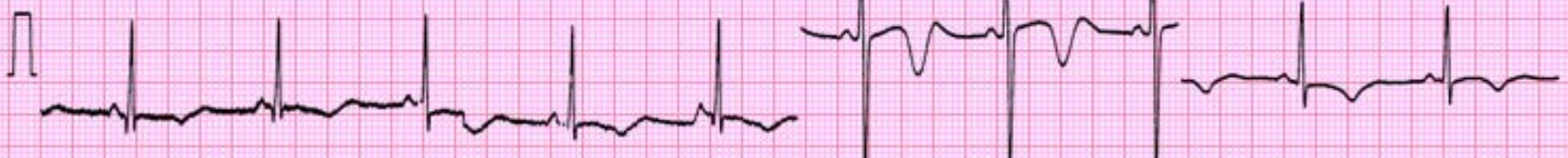
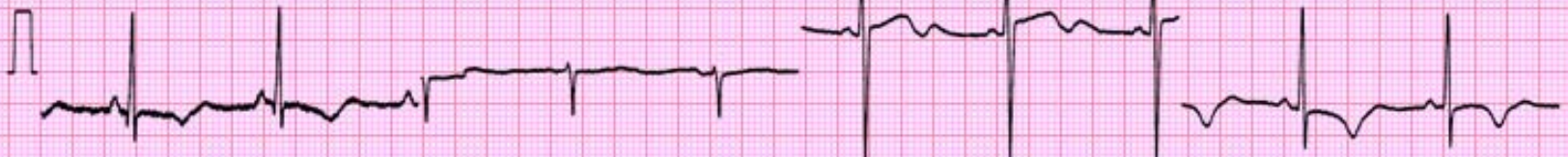
Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF
I-II-III

aVR-aVL-aVF

10mm/mV
VI-V2-V3

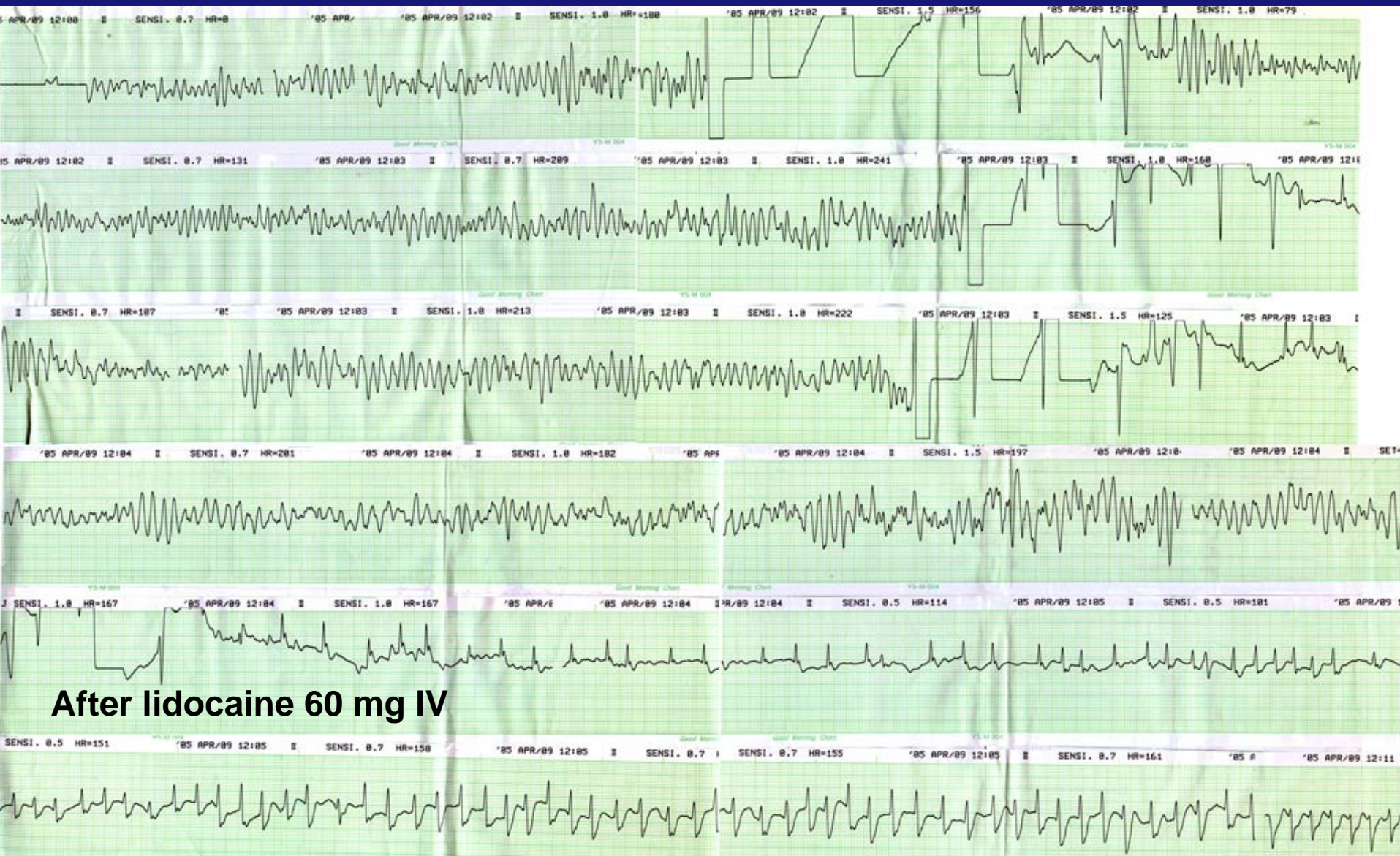
V4-V5-V6



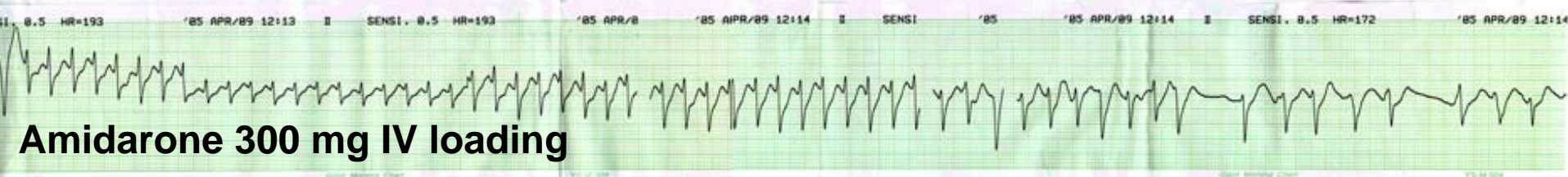
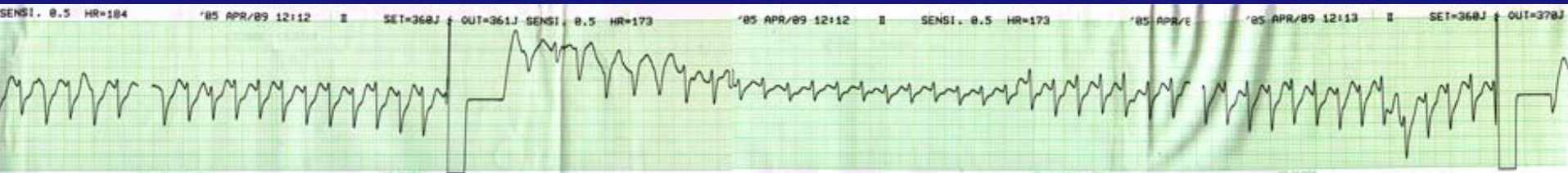
Rhythm(11) 10mm/mV



April, 9. 10 am



After lidocaine 60 mg IV



Amiodarone 300 mg IV loading



Lidocaine 1 mg/kg maintenance



Stop lidocaine and amiodarone



After Cardiac arrest & CPR

Name:

Apr. 9, 2005 4:21pm

ID:

Room:

Sinus rhythm

years

Right bundle branch block

cm kg / mmHg

Twave abnormality, consistent with anterolateral ischemia

Med.:

Twave abnormality, possible inferior ischemia

Abnormal right axis deviation

** abnormal ECG **

Vent. Rate 65bpm

PR int. 136ms

QRS dur. 136ms

QT/QTc int. 584/596ms

P/QRS/T axis 78/-104/-168°

RV5/SV1 amp. 1.14/0.14mV

Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF

I-II-III

aVR-aVL-aVF

10mm/mV

VI-V2-V3

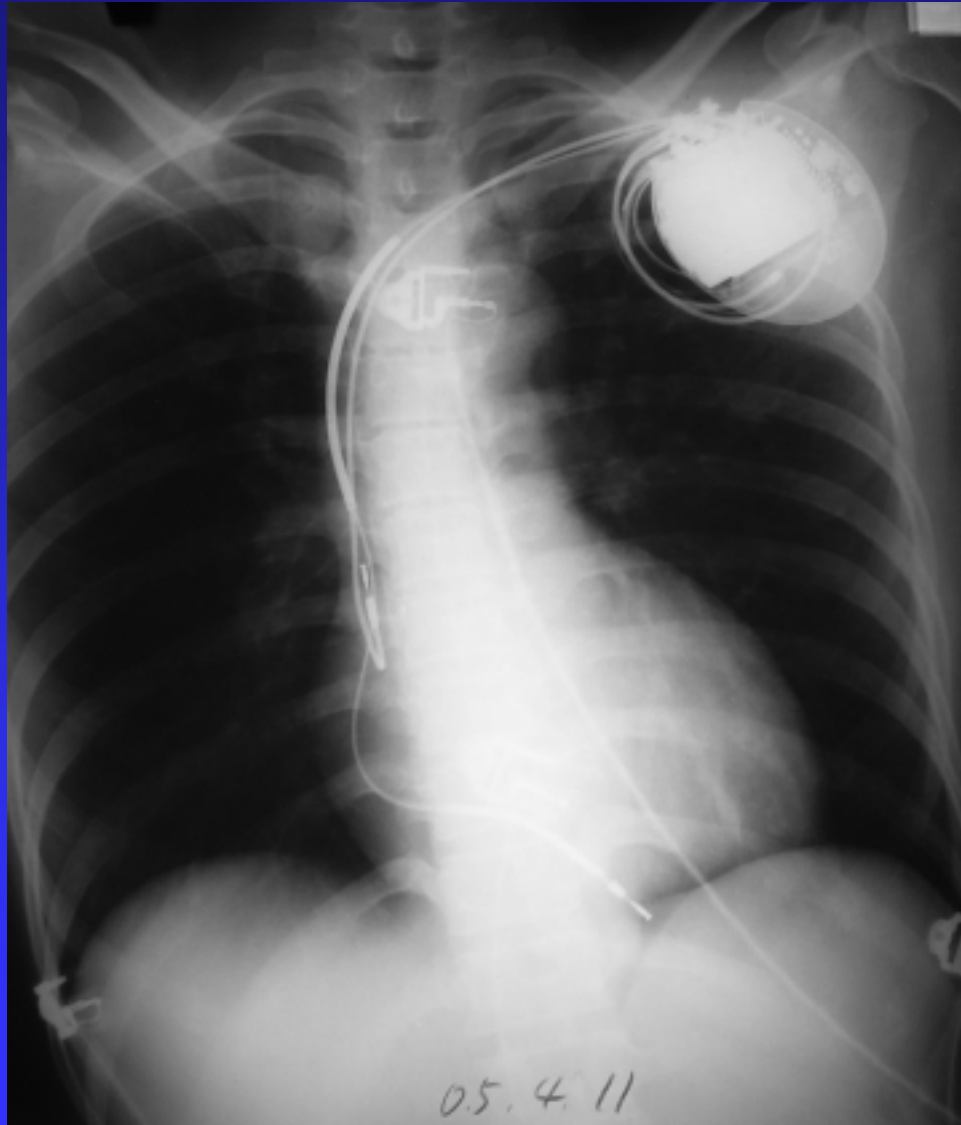
VI-V5-V6



Rhythm(III) 10mm/mV



Emergency implantation of dual chamber ICD at April, 9



2 days after ICD implantation

Post ICD

Apr. 9.2005 11:49pm

Name: _____
ID: _____ Room: _____ Sinus rhythm
_____ years Right bundle branch block
cm kg / nullg Twave abnormality,possible anterolateral ischemia
Med.: _____ Twave abnormality,possible inferior ischemia
*** abnormal ECG ***

Vent. Rate 84bpm
PR int. 128ms
QRS dur. 140ms
QT/QTc int. 524/565ms
P/QRS/T axis 74/ 92/ -74°
RV5/SVI amp. 0.57/0.14mV

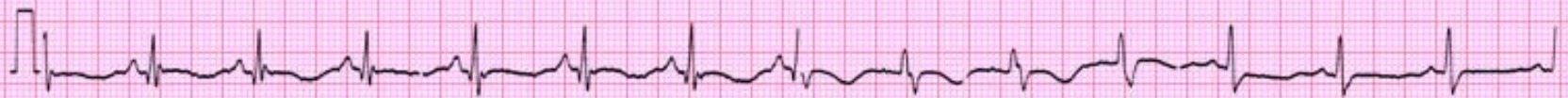
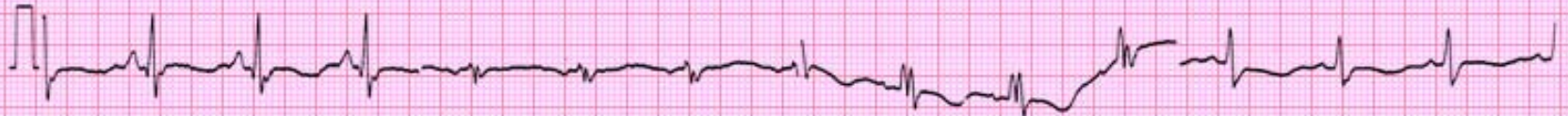
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I II III

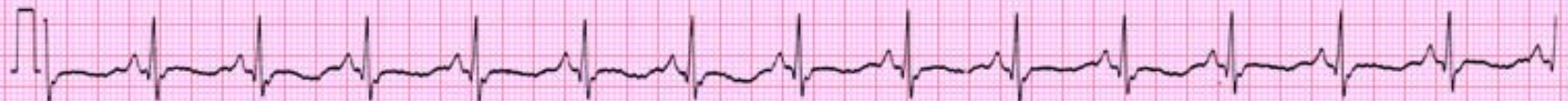
aVR-aVL-aVF

10mm/mV
V1-V2-V3

V4-V5-V6



Rhythm(11) 10mm/mV



Long Term treatment of LQTS

- Long-term treatment has as its purpose shortening the QTc interval and preventing recurrence of TdPs, treatment that reduces 10-year mortality to 3 to 4%.

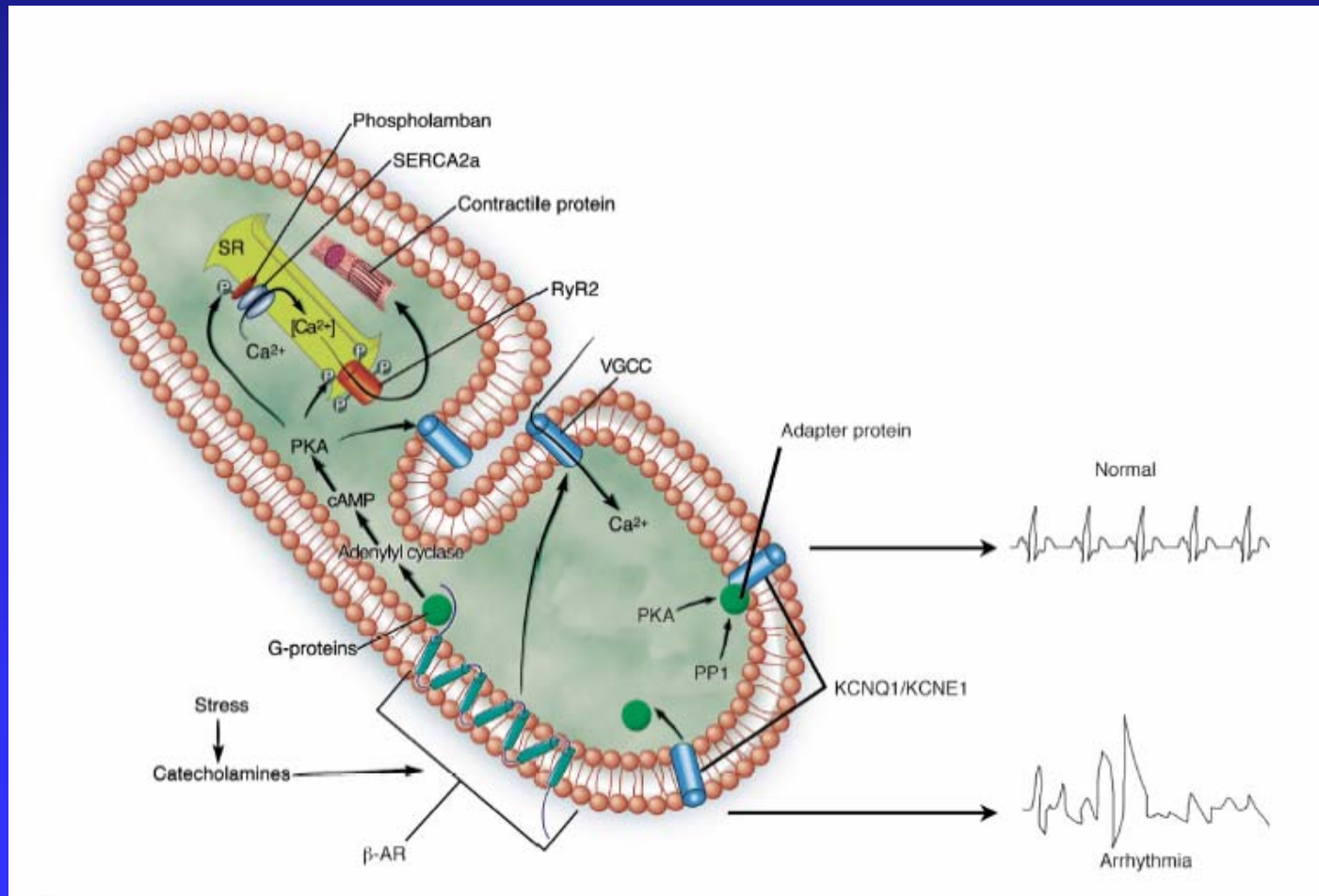
- **Beta blockers**

Main stay of long-term treatment.

Propranolol, daily dose of 2 to 3 mg/kg, but all beta-blockers should be effective.

- **Maximum HR of 130 beats/min on treadmill exercise testing,**
- **Most effective in the LQT1, in which exercise and physical exertion are the most common triggers for an arrhythmic event.**

Disruption of local signaling domains occurs in LQT-1



- **Permanent pacemaker**
- **Symptomatic despite full dose of beta-blockers and**
- **Bradycardia is a prominent feature of the syndrome**
- **Beta-blockers should be continued.**
- **Pacing at relatively high rates (more than 80 beats per minute) may be required**

- **ICD**

- **Combination of beta-blockers and pacing fails to prevent presyncopal or syncopal episodes**
- **Initial event is resuscitated cardiac arrest.**
- **ICD does not prevent TdPs but does prevent SCD**
- **Beta-blocker should be continued**
- **Use a device with dual-chamber pacing as a first-line therapy to prevent sudden cardiac death in symptomatic patients with a congenital LQTS**

- **Left thoracic sympathectomy**
Highly effective method of anti-adrenergic therapy.

- **New mutation specific therapies**
- **Flecainide and mexiletine for LQT3**
- **Flecainide therapy (75 to 150 mg twice daily) significantly shortened the QT and QTc intervals in asymptomatic carrier of the mutation.**

Effects of Flecainide in Patients With New *SCN5A* Mutation Mutation-Specific Therapy for Long-QT Syndrome?

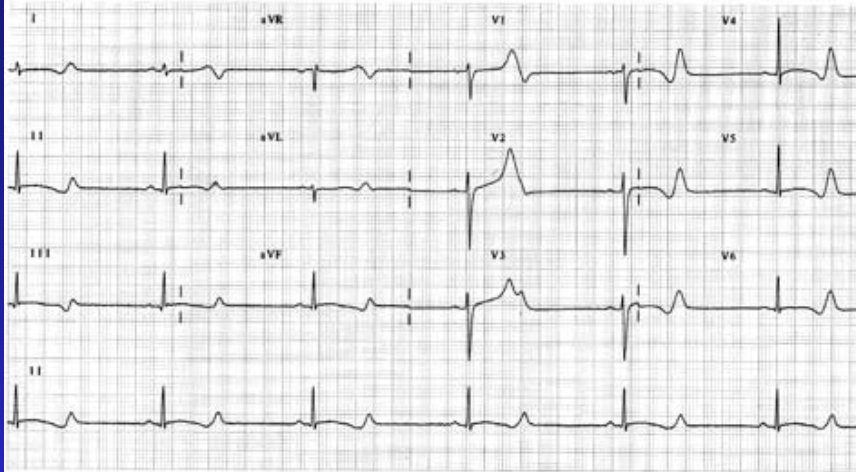
J. Benhorin, MD; R. Taub, RN; M. Goldmit, MSc; B. Kerem, PhD; R.S. Kass, PhD;
I. Windman, PhD; A. Medina, MD

Background—Mutations in the cardiac sodium channel gene (*SCN5A*) can cause one variant of the congenital long-QT syndrome. The effects of some of these mutations on the α -subunit channel properties can be blocked by type Ib antiarrhythmic drugs. Recently, we have described a new *SCN5A* mutation (*D1790G*) that affects the channel properties in a manner suggesting that sodium blockers of the Ib type will be ineffective in carriers of this mutation. Hence, the ECG effects of flecainide-acetate, a type Ic sodium blocker, were evaluated in carriers of this mutation.

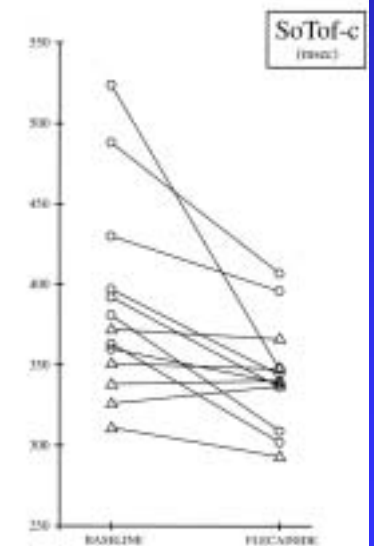
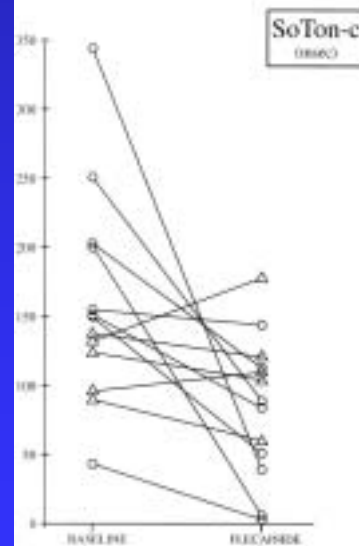
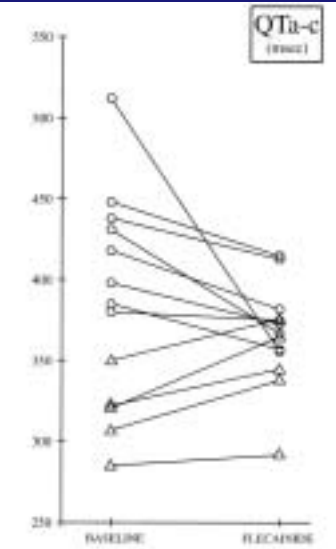
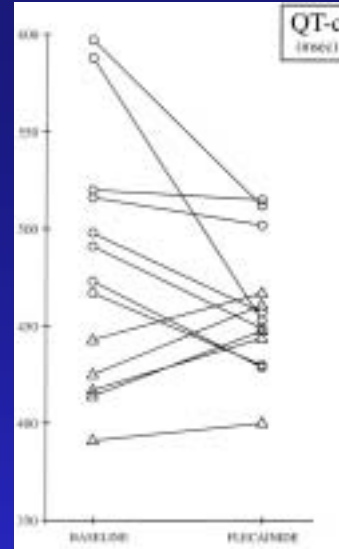
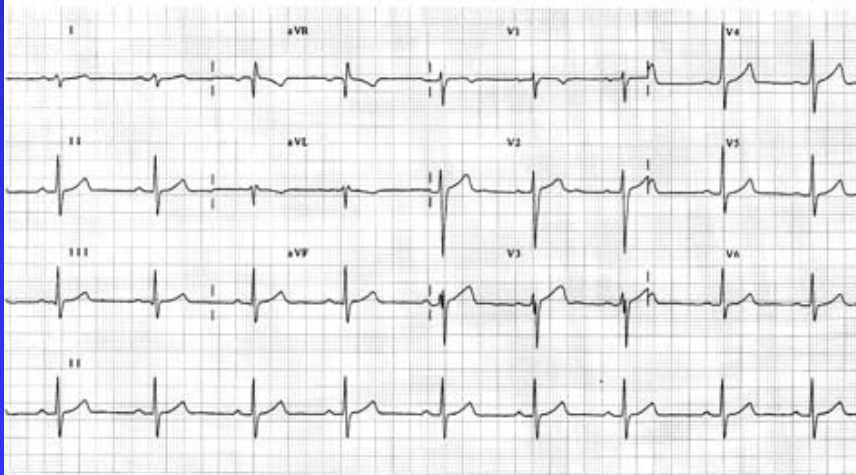
Methods and Results—Eight asymptomatic mutation carriers and 5 control subjects were studied. Intravenous lidocaine was tested first in only 2 mutation carriers and had no significant effect on any ECG parameter. Flecainide significantly shortened all heart rate-corrected repolarization duration parameters only in carriers and not in control subjects: QT_c shortened by 9.5% (from 517±45 to 468±36 ms, $P=0.011$), and the S-offset to T-onset interval shortened by 64.7% (from 187±88 to 66±50 ms, $P=0.0092$). Flecainide also normalized the marked baseline repolarization dispersion in most mutation carriers. These effects among carriers were maintained during long-term (9 to 17 months) outpatient flecainide therapy with no adverse effects.

Conclusions—This report is the first to describe *SCN5A* mutation carriers who significantly responded to flecainide therapy yet did not respond to lidocaine. These results have important implications for long-QT allele-specific therapeutic strategies. (*Circulation*. 2000;101:1698-1706.)

BASELINE



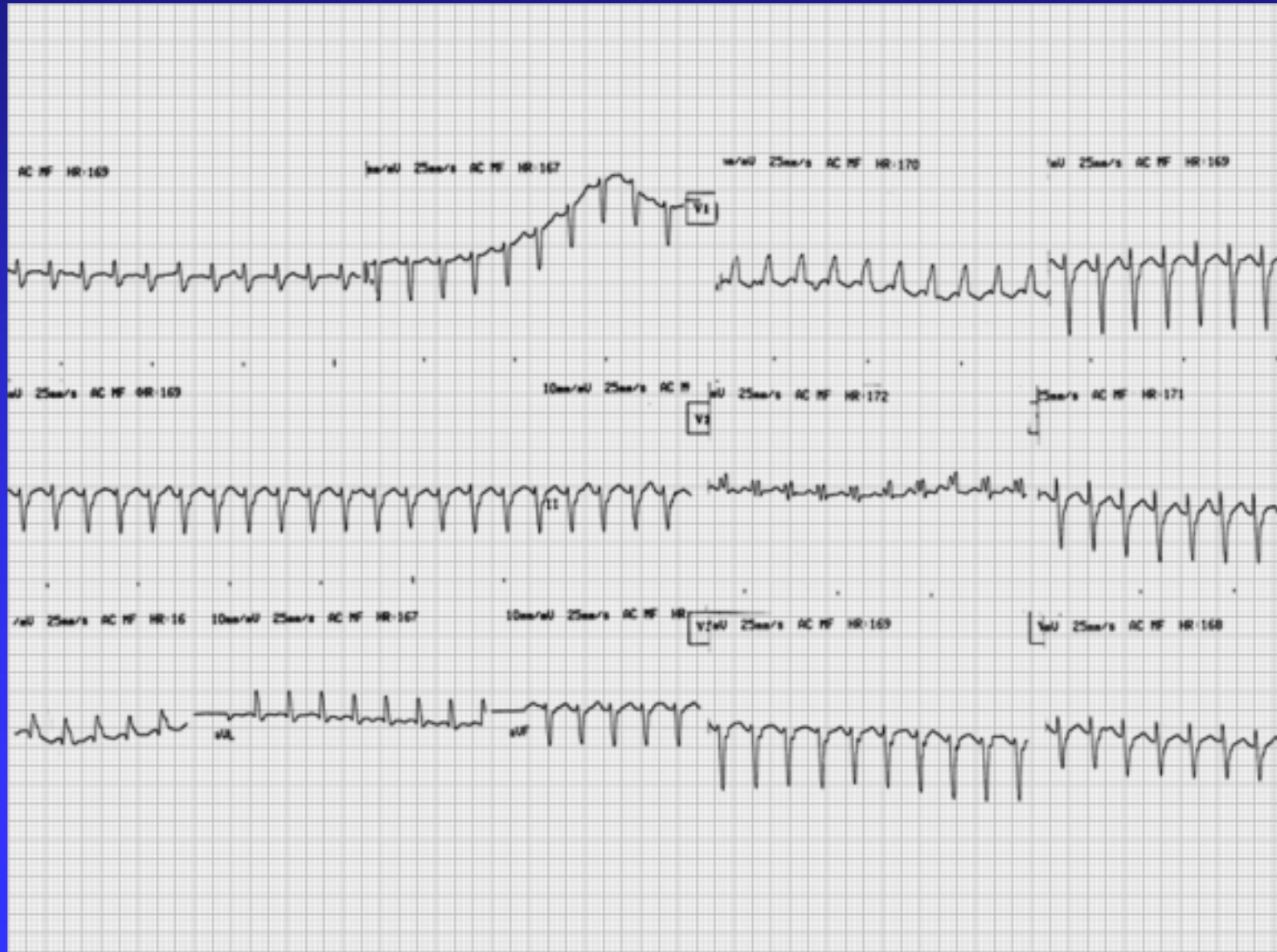
FLECAINIDE



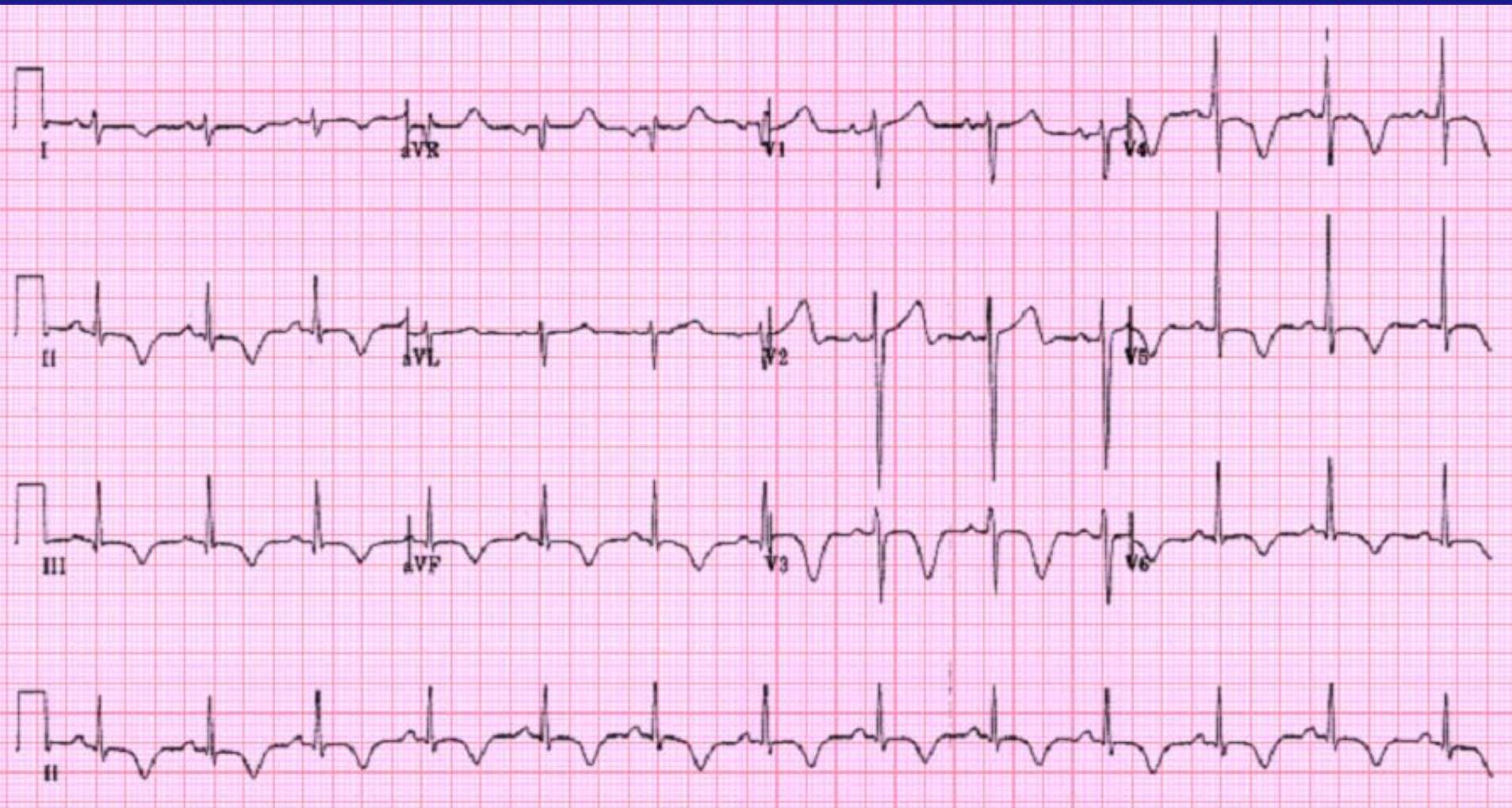
- **Potassium administration** for LQT2.
- Calcium channel blockers, potassium channel activators (nicorandil, pinacidil), and other sodium channel blockers (pentisomide), in investigation

**Ventricular Tachycardia
Induced Cardiomyopathy
Related QT prolongation**

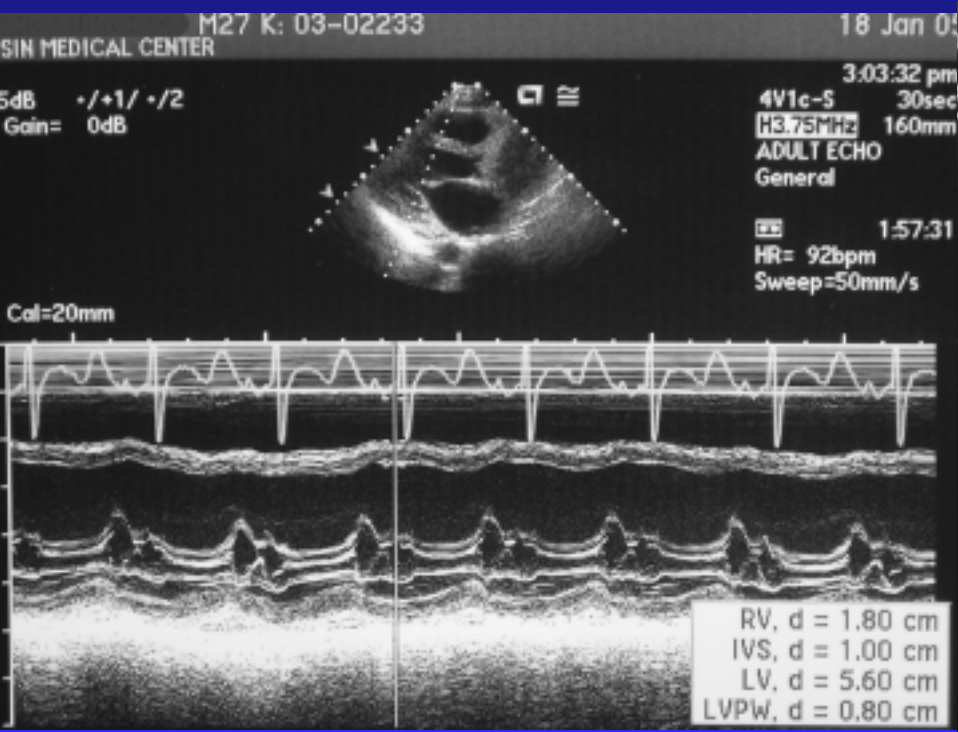
27 years old male. Palpitation and weakness for 2 months



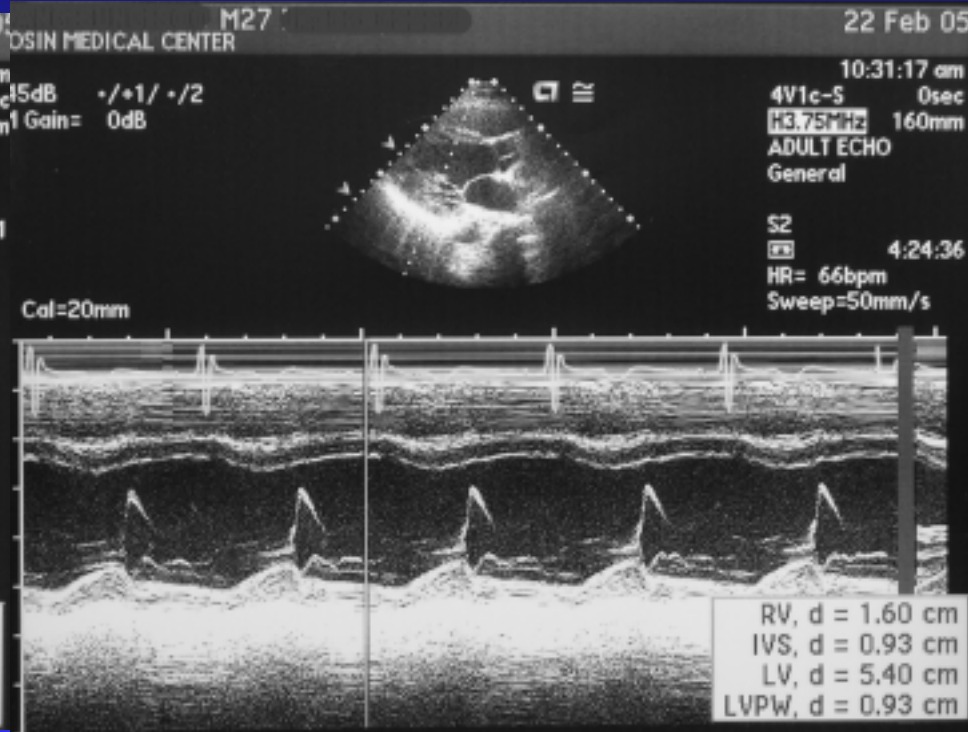
After DC cardioversion



Jau/21/2005, QTc 532 msec



Jau/18/2005
EF: 35%



Feb/22/2005
EF: 57%

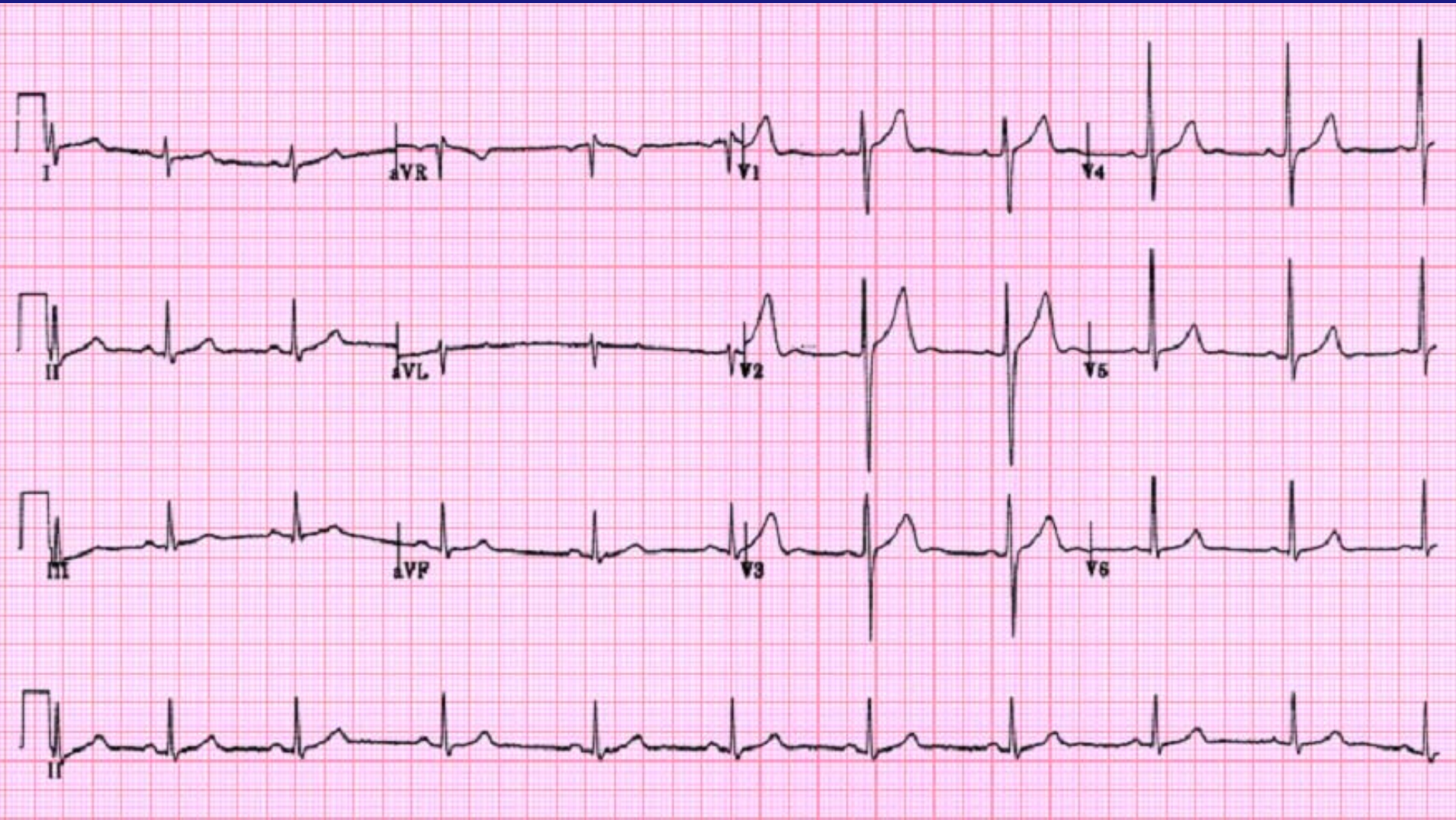


Jau/20/2005



Feb/22/2005

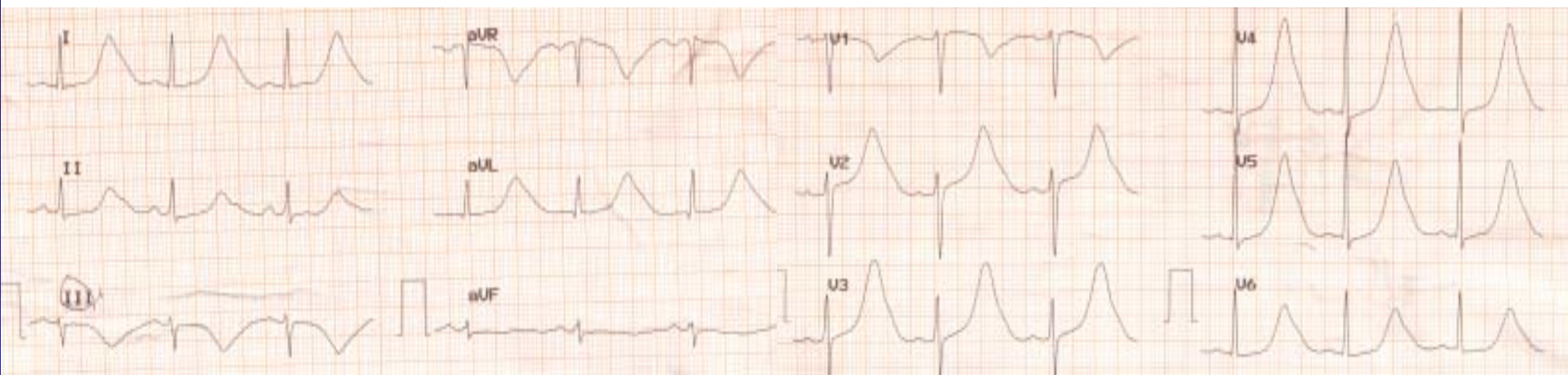
Follow up EKG, 1 month later



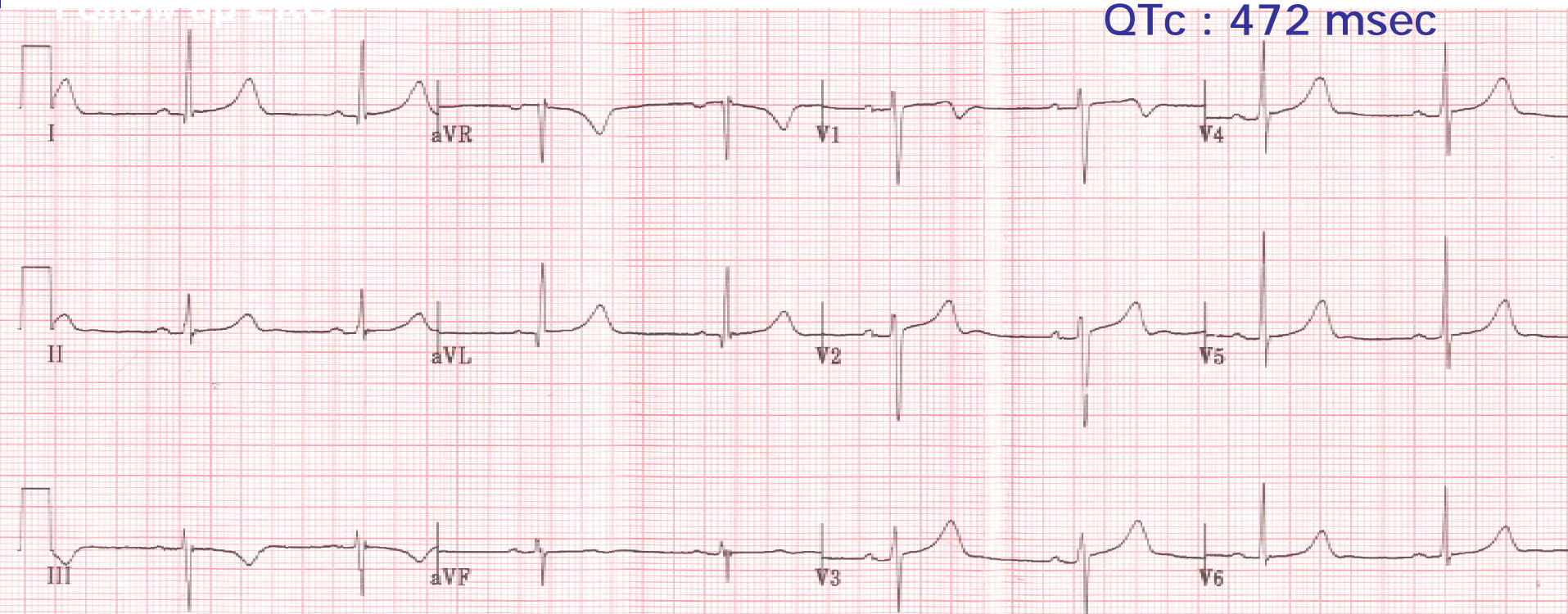
Feb/22/2005, QTc 410 msec

Drug related QT prolongation

50 years old female, syncope after 2 month tinea pedis Tx. QTc : 760 msec



QTc : 472 msec



0 , 68/M

C/C: Whole body itching sense and skin eruption

P/I:

- **Jun, 7, 2004: Lt pontine infarction**
- **Jun, 28, 2004: Chest pain and NSTEMI**
Proximal LAD total obstruction,
Didn't try PTCA due to long, small and diffuse
- **Mar, 3, 2005. Voiding difficulty – cystostomy and**
ozex (toxufloxacin) medication → generalized skin
rash
- **Mar, 28, 2005: more aggravated skin rash →**
admission to cardiology department.
- **Past H/x: DM, HTN since 1999**

April, 1. after this EKG, hold zyrtec

Name:
ID:
years
cm kg / mmHg
Med.:

Room:

Sinus rhythm
with occasional ventricular premature complexes
Twave abnormality consistent with anterolateral ischemia
** abnormal ECG **

Apr. 1, 2005 6:26am

Vent. Rate 61bpm
PR int. 204ms
QRS dur. 96ms
QT/QTc int. 584/586ms
P/QRS/T axis 47/ 50/ 87°
RV5/SVI amp. 1.05/1.35mV

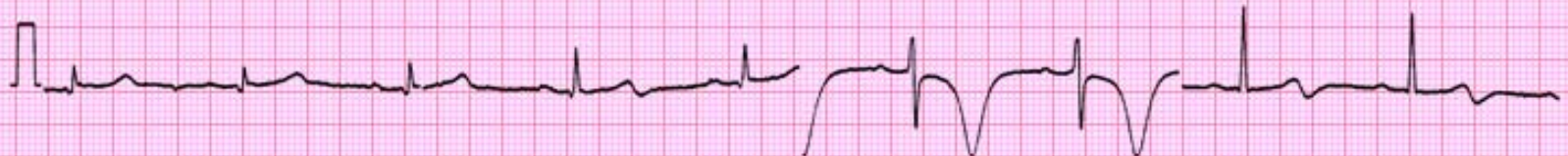
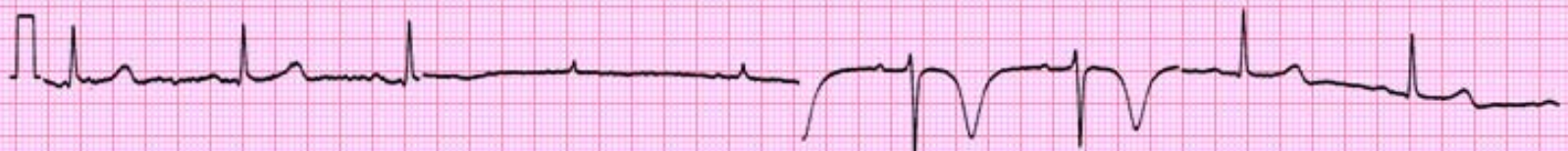
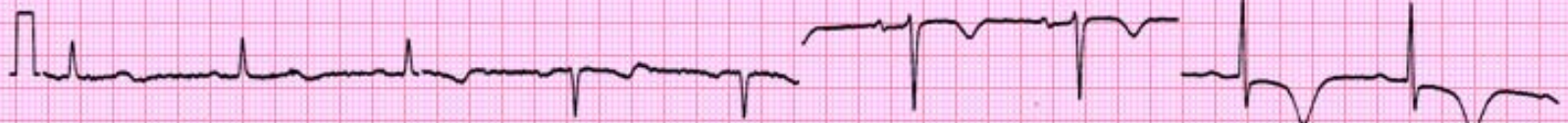
Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF
I-II-III

aVR-aVL-aVF

10mm/mV
V1-V2-V3

V4-V5-V6



Rhythm(11) 10mm/mV



Table 1. Specific mutations reported in acquired long-QT syndrome case studies. Individual case-report studies in which drugs in combination with an underlying mutation in one of the known congenital LQTS genes led to serious ventricular arrhythmia.

Gene	Mutation	Amino-acid change	Drugs	Risk factors	Symptoms	Reference
<i>KCNQ1</i>	944A > G	Y315C	Cisapride	Hypokalemia, elderly woman (77 yrs)	Sudden loss of consciousness, cardiac arrest	14
	1663 C > T	R555C	Terfenadine or disopyramide or mefloquine	Congenital LQTS	Sudden death, syncope, TdP	11
	1747 C > T	R583C	Dofetilide		TdP	8
<i>KCNH2</i>	1039 C > T	P347S	Cisapride + clarithromycin + sulfamethoxazole	Elderly woman (77 yrs), congestive heart failure, ventricular pacemaker	TdP, QTc >600 ms (normal 440 ms)	13 + 17
	1048 C > T	R328C	not specified		TdP	9
<i>KCNE2</i>	2350 C > T	R784W	Amiodarone		TdP	8
	22 A > G	T8A	Sulfamethoxazole		QTc >600 ms	7
	25 C > G	Q9E	Clarithromycin	Elderly woman (76 yrs), diabetic, history of stroke, hypokalemia	TdP, VF requiring defibrillation	12
	161 T > C	M54T	Procainamide		TdP	7
	170 T > C	I57T	Oxatomide		TdP	7
<i>SCN5A</i>	347 C > T	A116V	Quinidine + mexiletine	Woman (55 yrs), history of cardiac arrest	Syncope with TdP	7
	1844 G > A	G615E	Quinidine		TdP	8
	1852 C > T	L618F	Quinidine		TdP	8
	3305 C > A	S1102Y	Amiodarone	AA* woman (36 yrs) with DCM** and hypokalemia	TdP	10
	3748 T > C	F1250L	Sotalol		TdP	8
	4999 G > A	V1667I	Halofantrine	QTc(baseline) >440 ms, congenital LQTS	Syncope, TdP, heart block, QTc >600 ms	15
	5474 T > C	L1825P	Cisapride	Elderly woman (70 yrs)	TdP	16

* AA = African-American, ** DCM = dilated cardiomyopathy.

Drugs metabolized by cytochrome P450 3A4/5 and its clinically most relevant inhibitors.

CYP3A4/5 substrates		CYP3A4/5 inhibitors
Amiodarone	Midazolam	Cimetidine
Astemizole	Nifedipine	Clarithromycin
Carbamazepine	Pimozide	Cyclosporin
Cisapride	Propafenone	Diltiazem
Cyclosporin	Quinidine	Erythromycin
Dapsone	Tacrolimus	Fluconazole
Diltiazem	Tamoxifen	Fluoxetine
Disopyramide	Terfenadine	Fluvoxamine
Erythromycin	Testosterone	Grapefruit juice
Felodipine	Valproic acid	Itraconazole
Lidocaine	Verapamil	Ketoconazole
Indinavir		Miconazole
Lovastatin		Ritonavir

Adapted from Dresser et al. 2000 (20).

QTc Prolongation by Grapefruit Juice and Its Potential Pharmacological Basis

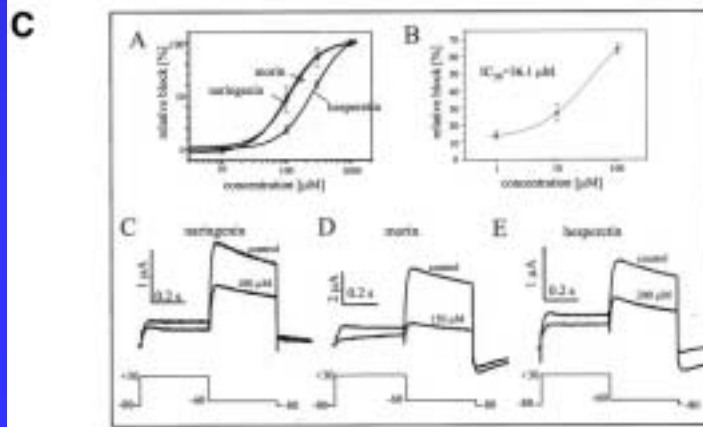
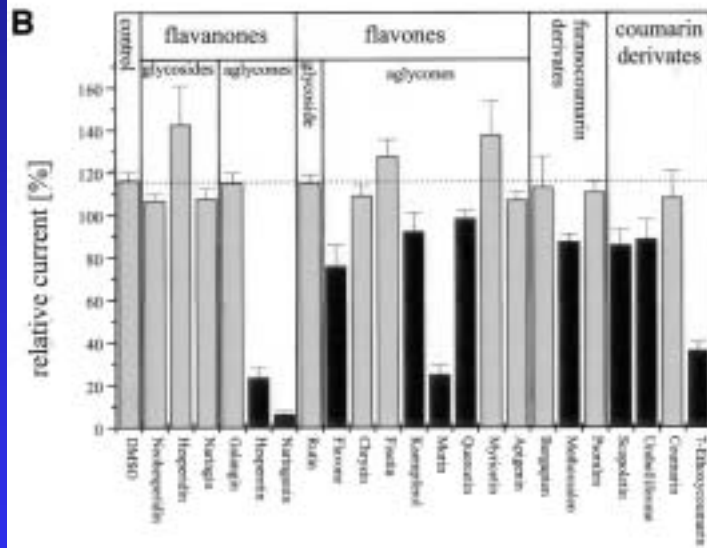
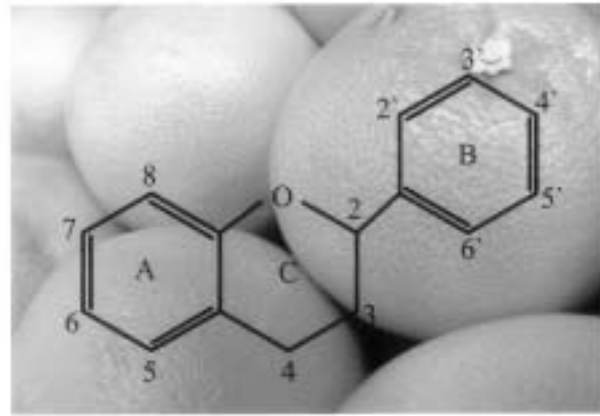
HERG Channel Blockade by Flavonoids

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Background—A high intake of dietary flavonoids, which are abundant in fruits, vegetables, tea, and wine, is known to reduce cardiovascular mortality. The effects of flavonoids on cardiac electrophysiology, which theoretically may have both antiarrhythmic and proarrhythmic consequences, have not been studied systematically to date.

Methods and Results—We screened a broad spectrum of flavonoids for their inhibitory activity on HERG channels by using heterologous expression in *Xenopus* oocytes. At a concentration of 1 mmol/L, 10 compounds caused a significant inhibition of HERG currents, whereas 11 other flavonoids had no effect. The IC₅₀ value for HERG block by naringenin, the most potent inhibitor, was 102.3 μmol/L in *Xenopus* oocytes and 36.5 μmol/L in HEK cells. To demonstrate the physiological relevance of these findings, we studied the effects of pink grapefruit juice, which contains large amounts of naringenin glycosides (>1000 μmol/L), in human volunteers. In 10 persons, we observed a peak QTc prolongation of 12.5±4.2 ms 5 hours after oral ingestion of 1 L of grapefruit juice. This effect was significant (*P*=0.02).

Conclusions—We found a significant QTc prolongation by grapefruit juice in healthy volunteers, probably caused by block of HERG channels by flavonoids. These findings reveal new perspectives on the potential for dietary modification of cardiac electrophysiology. (*Circulation*. 2005;111:835-838.)

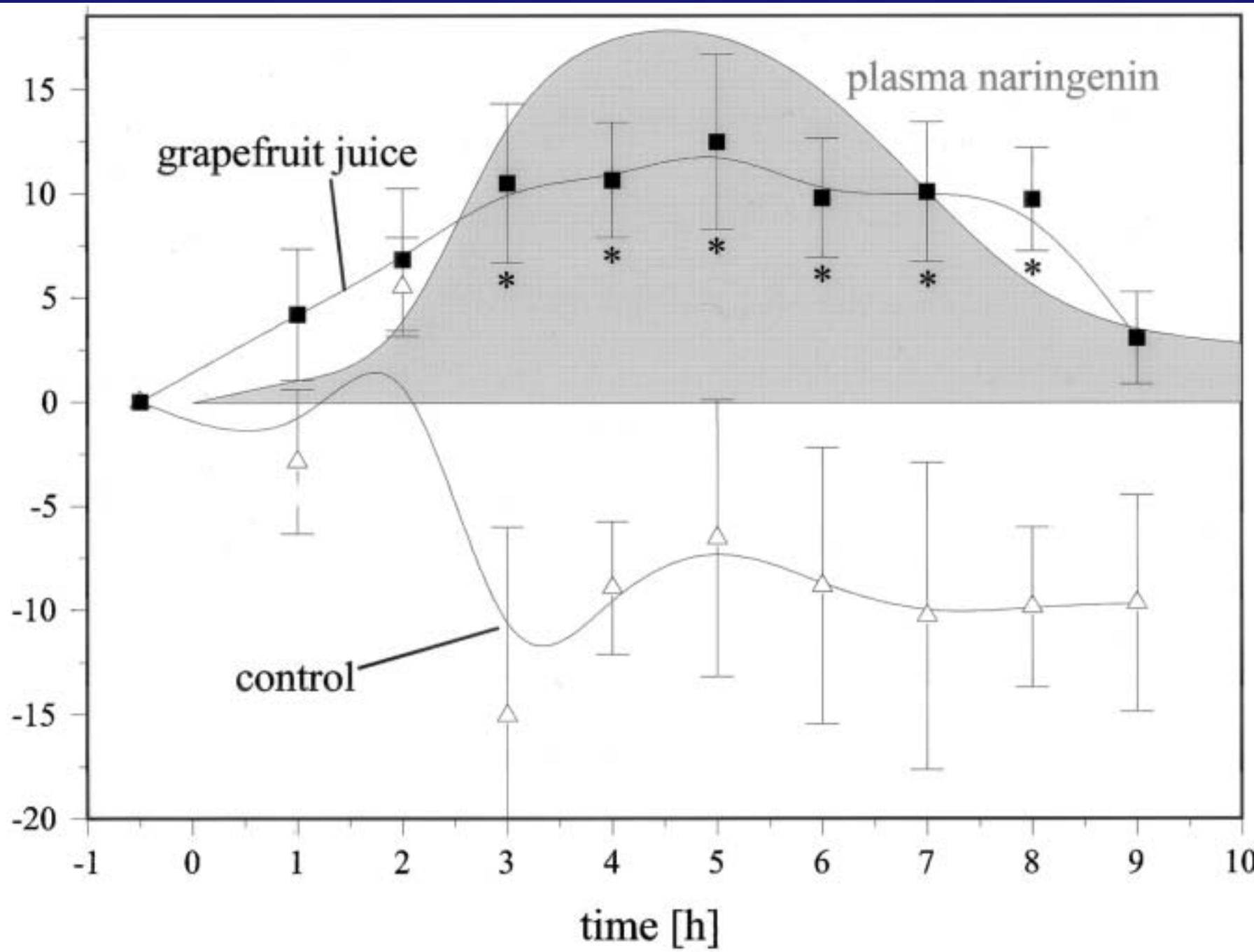


QTc-difference [ms]

plasma naringenin

grapefruit juice

control



Oral Erythromycin and the Risk of Sudden Death from Cardiac Causes

Table 1. Characteristics of the Cohort According to Antibiotic Use.*

Characteristic	Antibiotic Use			
	None	Former Use of Erythromycin	Current Use of Erythromycin	Current Use of Amoxicillin
Person-years (no.)	1,126,013	111,779	5305	6846
Age				
Mean (yr)	45.0	42.2	41.4	41.7
≥65 yr (%)	26.0	18.6	16.5	17.9
Female sex (%)	68.7	78.6	77.6	76.2
White race (%)	57.5	66.0	69.3	70.7
No outpatient visit in past year (%)	23.6	2.7	2.5	2.1
≤1 prescription in past year (%)	32.0	3.3	1.8	2.0
Encounters involving cardiovascular disease (%)				
Any	33.2	46.1	47.0	46.4
Medication prescribed†	31.8	45.2	46.1	45.5
Visit to emergency department or hospital admission	2.9	4.7	4.3	4.2
Visit to emergency department or admission for noncardiovascular condition (%)	11.6	19.2	17.8	16.4

N Engl J Med, 2004, 351. 1086-1096

Oral Erythromycin and the Risk of Sudden Death from Cardiac Causes

Table 2. Incidence-Rate Ratio for Sudden Death from Cardiac Causes, According to Antibiotic Use.*

Antibiotic Use	Person-Years <i>number</i>	Deaths	Incidence-Rate Ratio (95% CI)
Current use of erythromycin	5,305	10	2.01 (1.08–3.75)
Current use of amoxicillin	6,846	8	1.18 (0.59–2.36)
Former use of erythromycin	111,779	100	0.89 (0.72–1.09)
None	1,126,013	1358	1.00

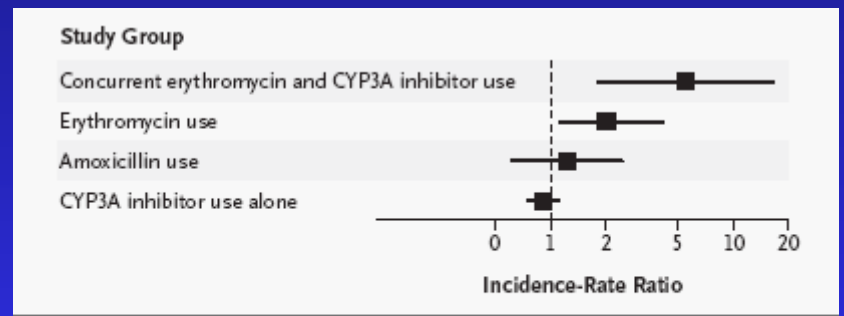


Figure 1. The Incidence-Rate Ratio for Sudden Death from Cardiac Causes According to the Current Use of the Study Antibiotic Medications and CYP3A Inhibitors.

April. 3, 2 day after zyrtec hold

Apr. 3, 2005 7:50am

Name:

ID:

years
cm kg

Room:

/ mmHg

Med.:

Sinus rhythm

Twave abnormality, possible anterior ischemia

** abnormal ECG **

Vent. Rate 61bpm

PR int. 200ms

QRS dur. 104ms

QT/QTc int. 440/444ms

P/QRS/T axis 51/ 47/ 64°

RV5/SV1 amp. 1.31/1.49mV

Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF

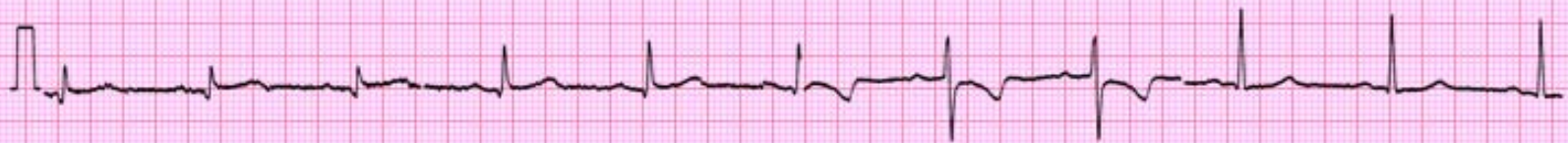
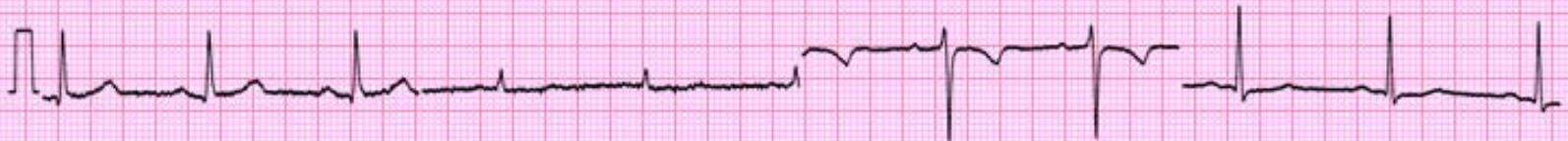
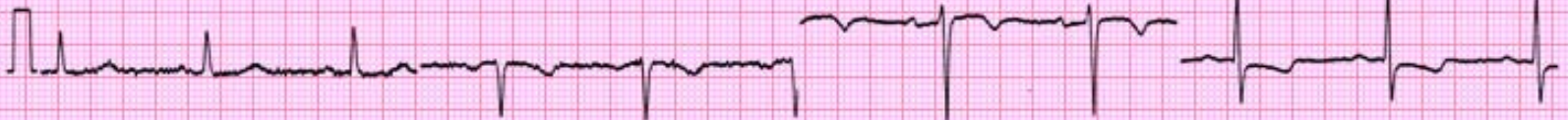
I-II-III

aVR-aVL-aVF

10mm/mV

V1-V2-V3

V4-V5-V6



Rhythm(II) 10mm/mV



April. 5, 4 days after zyrtec hold

Apr. 5, 2005 7:47am

Name: _____
ID: _____ Room: _____ Sinus rhythm
_____ years _____ Minimal ST depression
_____ cm _____ kg / _____ mmHg ARTIFACT PRESENT
Med.: _____ ** borderline ECG **

Vent. Rate 68bpm
PR int. 184ms
QRS dur. 100ms
QT/QTc int. 420/437ms
P/QRS/T axis 55/ 59/ 58°
RV5/SV1 amp. 1.41/1.56mV

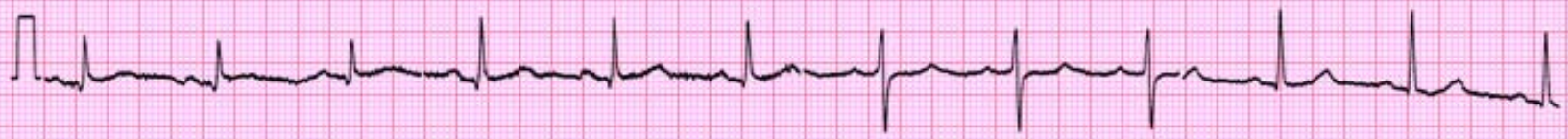
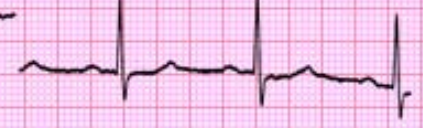
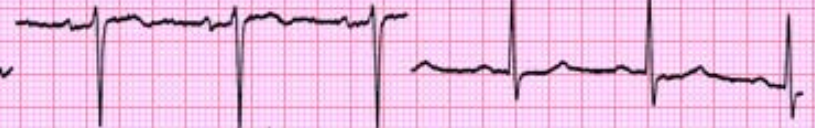
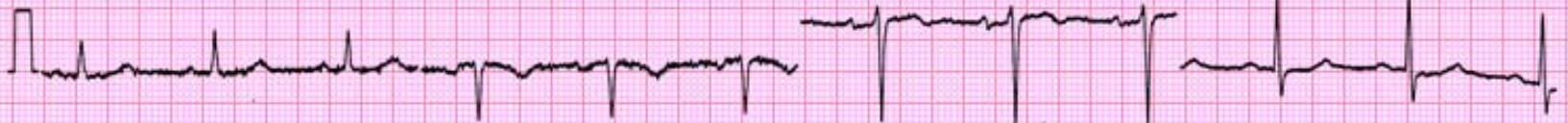
Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF
I-II-III

aVR-aVL-aVF

10mm/mV
V1-V2-V3

V4-V5-V6



Rhythm(11) 10mm/mV



April. 6, 6 days after zyrtec hold

Name:
ID: Room:
 years
 cm kg / mmHg
Med.:

Sinus rhythm
Nonspecific Twave abnormality
ARTIFACT PRESENT
** borderline ECG **

Apr. 6, 2005 6:49am

Vent. Rate 57bpm
PR int. 192ms
QRS dur. 96ms
QT/QTc int. 420/414ms
P/QRS/T axis 64/ -61/ -71°
RV5/SV1 amp. 1.66/1.65mV

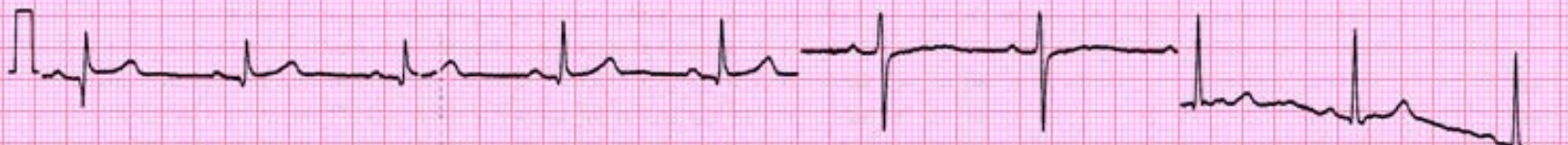
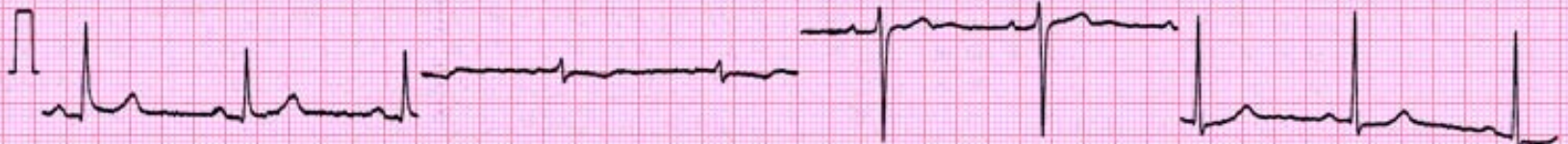
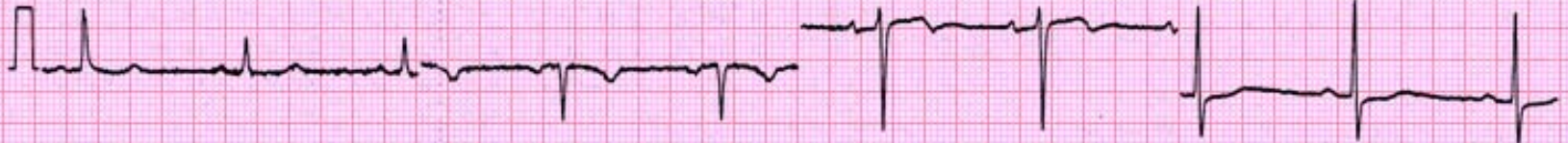
Unconfirmed Report Reviewed by:

10mm/mV 25mm/s Filter OFF
I-II-III

aVR-aVL-aVF

10mm/mV
V1-V2-V3

V4-V5-V6



Rhythm(11) 10mm/mV

