CREIGHTON UNIVERSITY
EMS EDUCATION

ADVANCED 12 LEAD ECG CONCEPTS 2012

2/15/2012

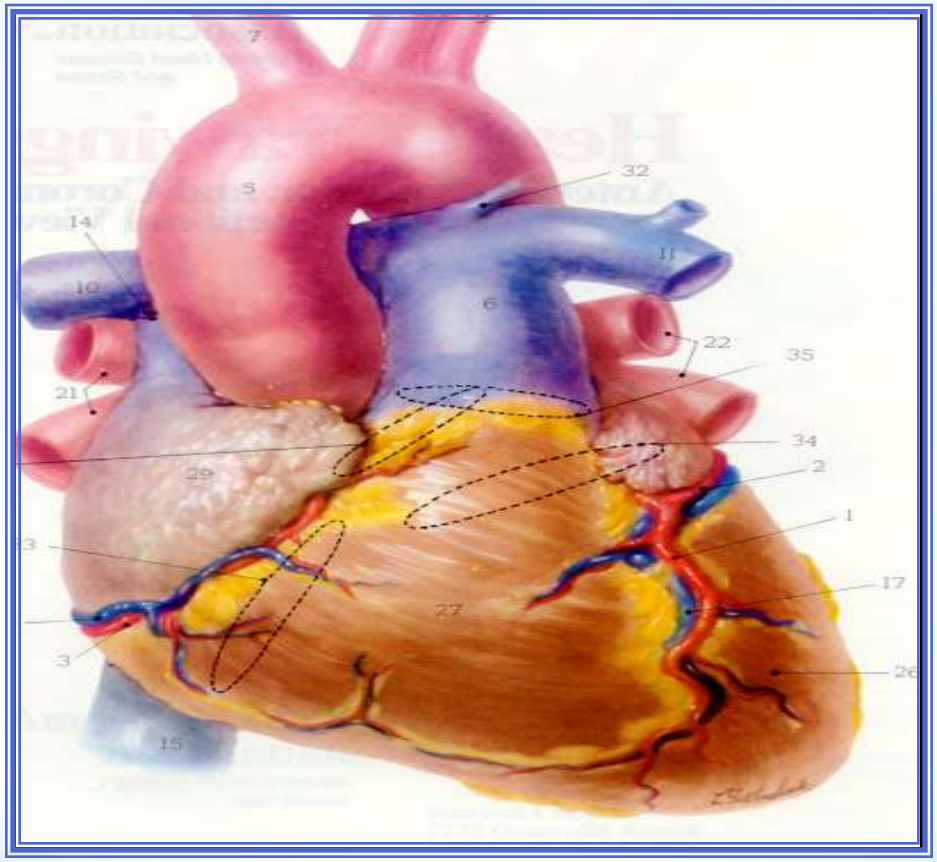
* Enhances 12 lead ECG Detection of Myocardial Ischemia, Injury And Infarction

* Recognize Blocks in Electrical Activity
  - Bundle Branch Blocks & Bi Fascicular Blocks
  - Identify Precursors to Complete Heart Block

* Helps to recognize ECG Rhythms and Disturbances

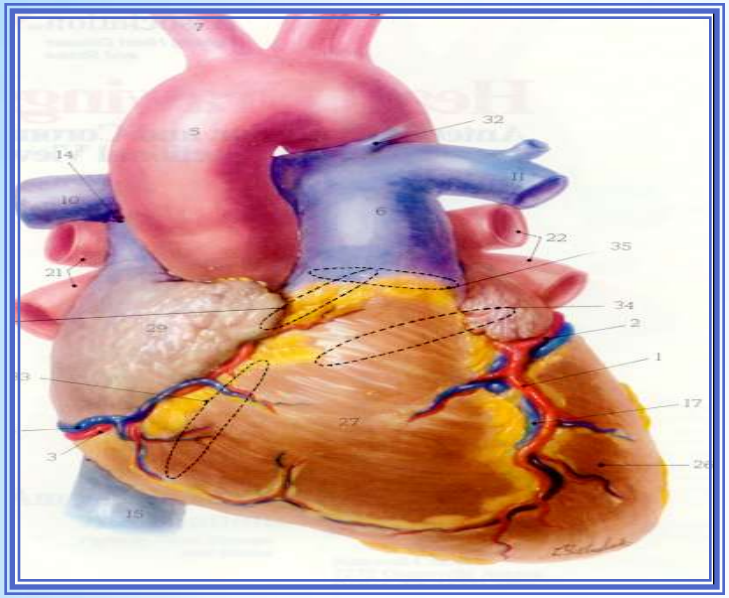
ADVANCED 12 LEAD ECG

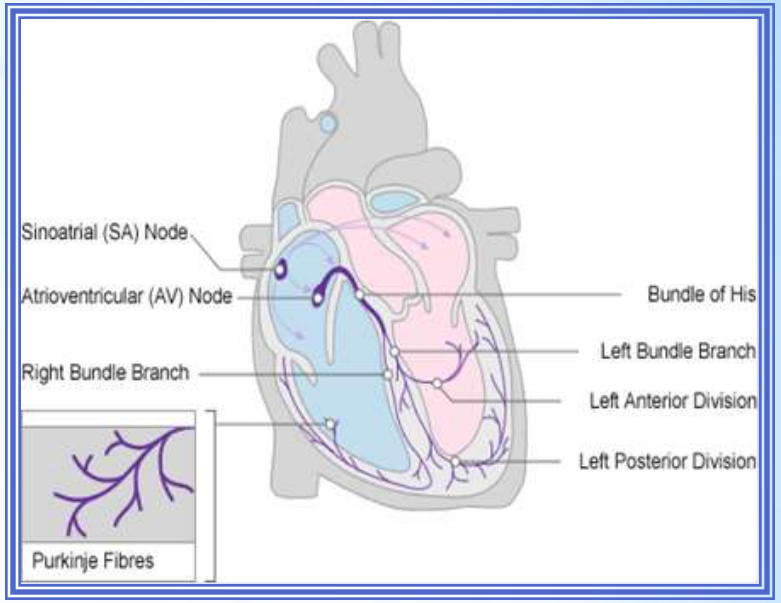
2/15/2012



CORONARY ANATOMY

2/15/2012





INFERIOR WALL

RCA

SA Node 55%
AV Node 90%
Bundle of His
Left Posterior Fascicle

ANTERIOR WALL

LAD

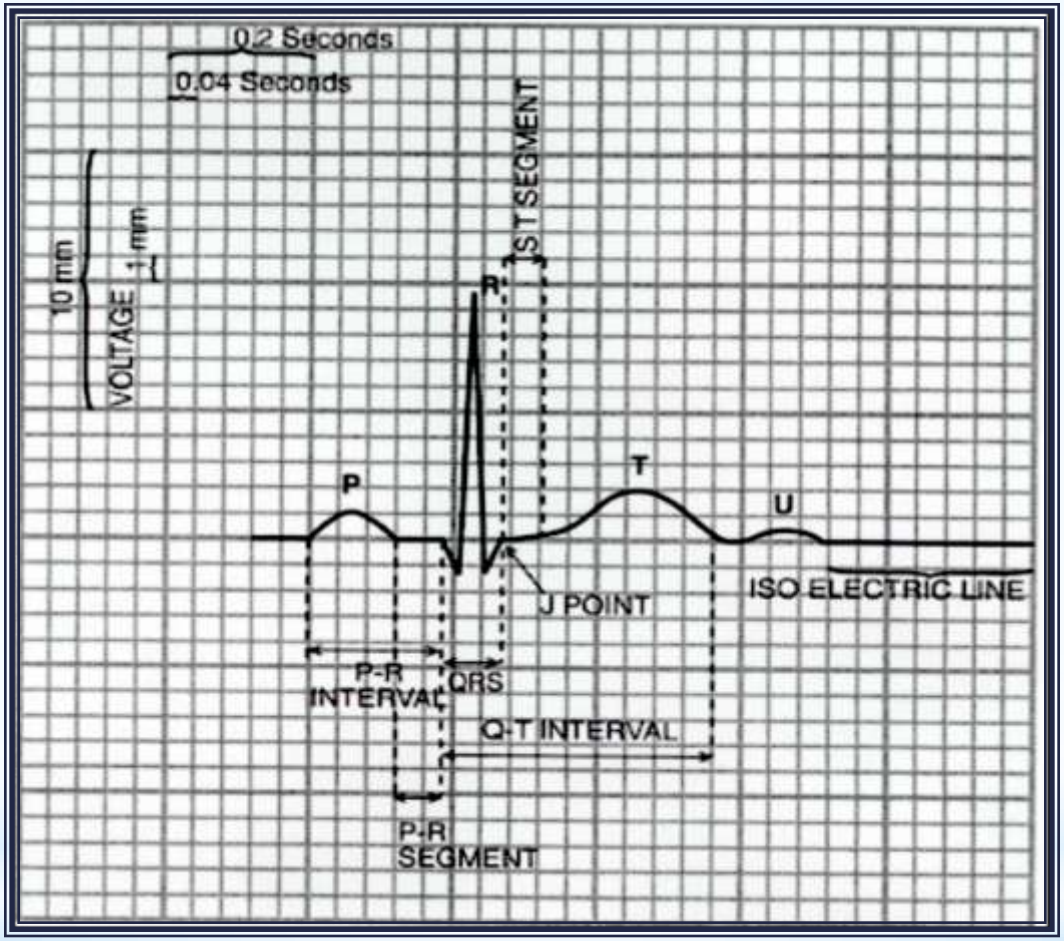
Bundle of His
Left Anterior Fascicle
Right Bundle Branch
Left Posterior Fascicle

LATERAL WALL

LCX

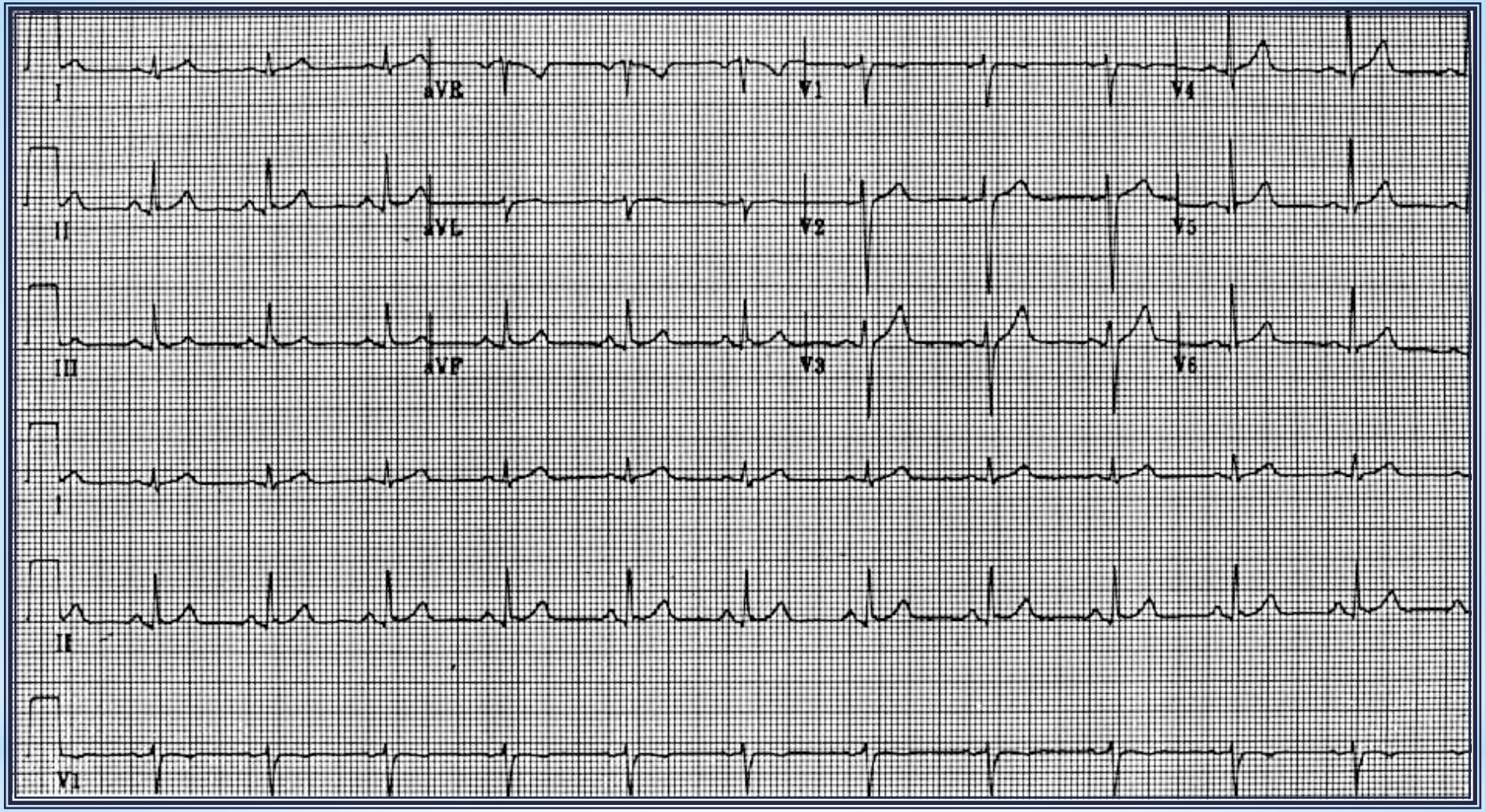
SA Node 45%
AV Node 10%
(Inferior Wall 10%)

2/15/2012



12 LEAD CONCEPTS

2/15/2012



NORMAL 12 LEAD

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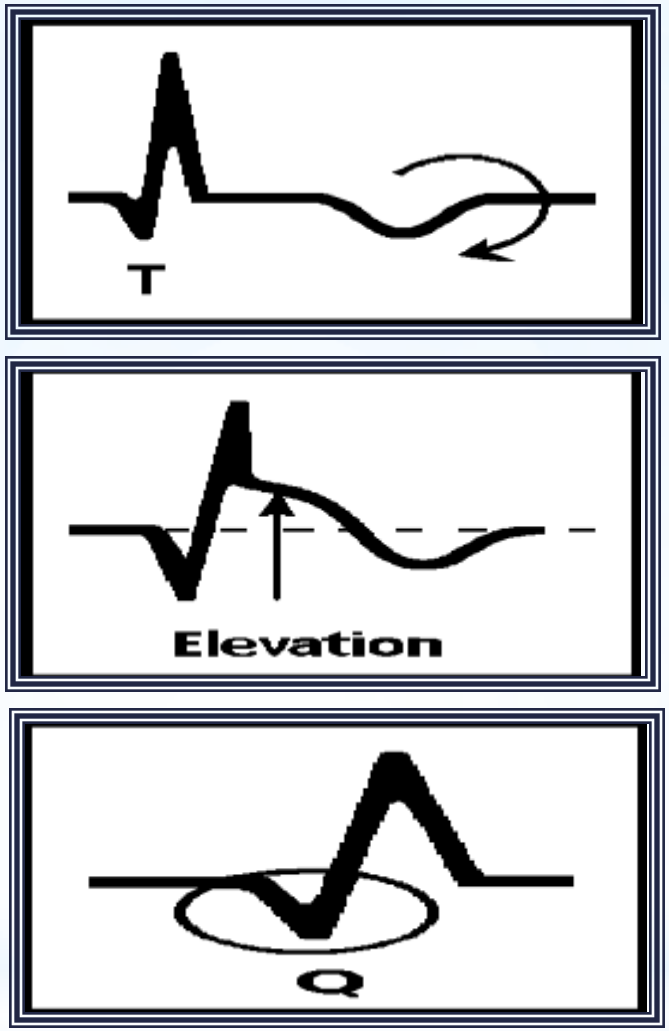
* Ischemia

* Injury

* Infarction



TRIAD OF INFARCTION

ECG rate & rhythm

Identify & treat patient

If pt. stable perform 12 Lead ECG

- Calibration mark
  10mm/1mv
- P wave upright in lead 1
- Evaluate QRS
  - > 3 boxes

(Inclusion Criteria)

- Patient ***18 years*** old or older
- Ischemic Discomfort for ***30 minutes*** but less then ***12 hours***
- ST Elevation greater then ***1mm*** in 2 contiguous Limb Leads or ***2mm*** or greater in 2 contiguous Chest Leads

  or

  Presumed ***New LBBB***

(Sgarbossa Criteria are Highly Specific for Acute Myocardial Infarction)

STEMI CHECKLIST

2/15/2012

STEMI CHECKLIST

(Exclusion Criteria)

- Active Internal Bleeding
  - 4 Weeks
- Stroke or TIA
- Any Surgery
  - 4 Weeks
- Brain Tumors, AVM, Aneurysms
- Bleeding Disorders
  - Hemophilia
- Presenting HTN
  - 180 systolic or 110 diastolic
- Use of Amphetamines or Cocaine
  - 3 days
- Cardiogenic Shock
  - BP less 90 or intubated
- Recent Trauma
  - Includes CPR for 2 minutes
- Back Pain / Dissecting Aneurysm
- Pericarditis or Endocarditis
- Pregnancy
- Oral Anticoagulants
  - 3 days

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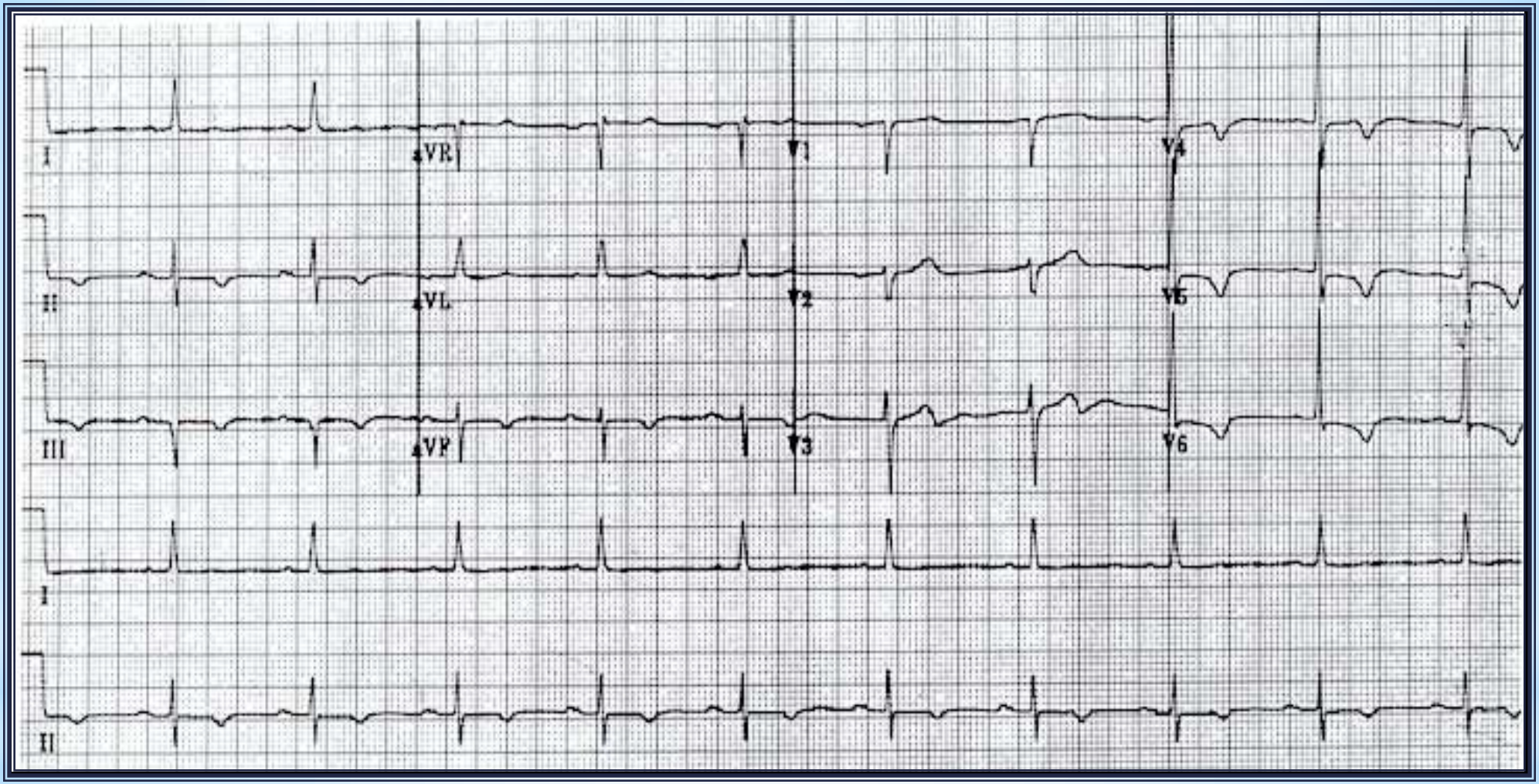

ISCHEMIA

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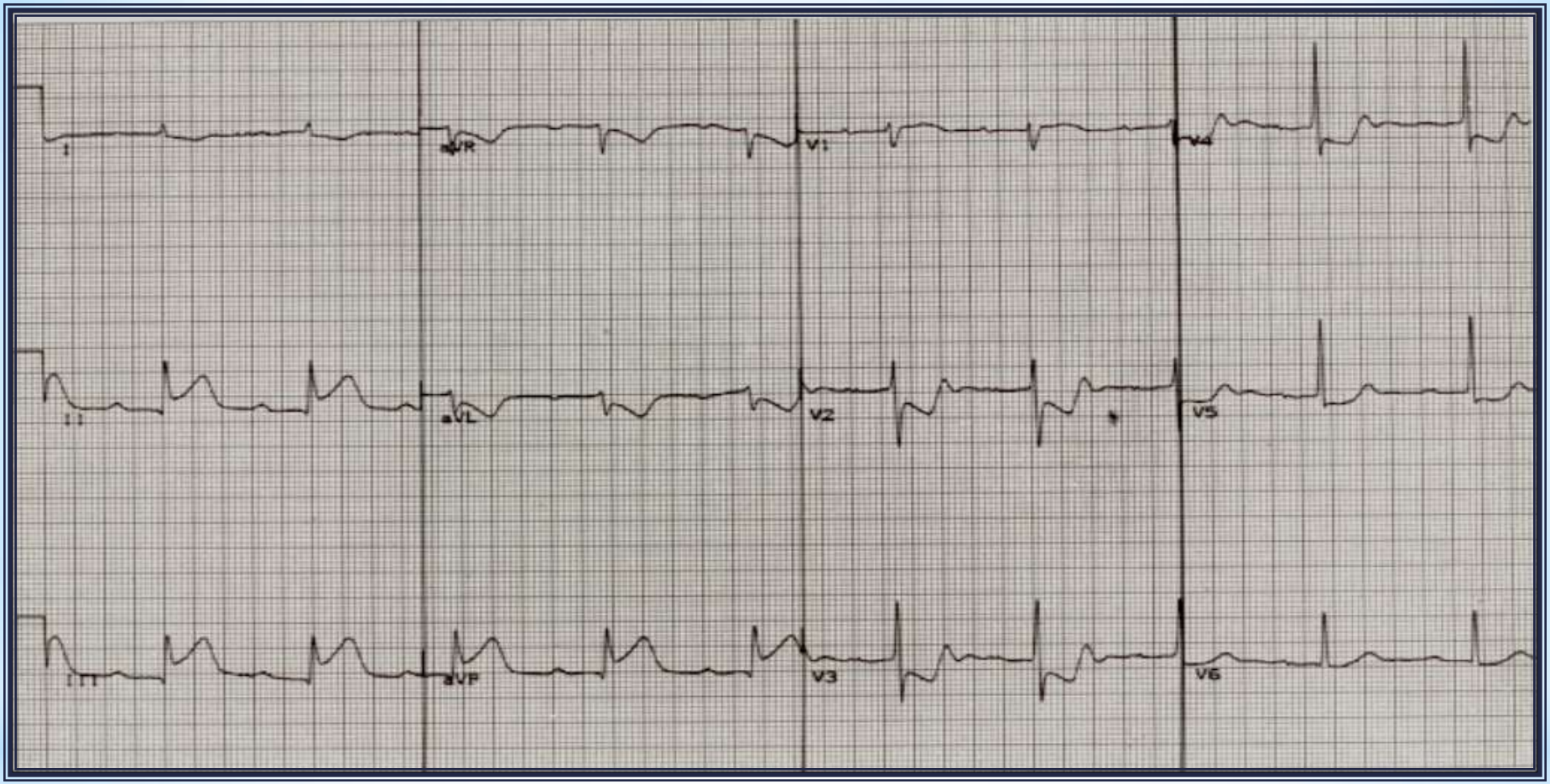
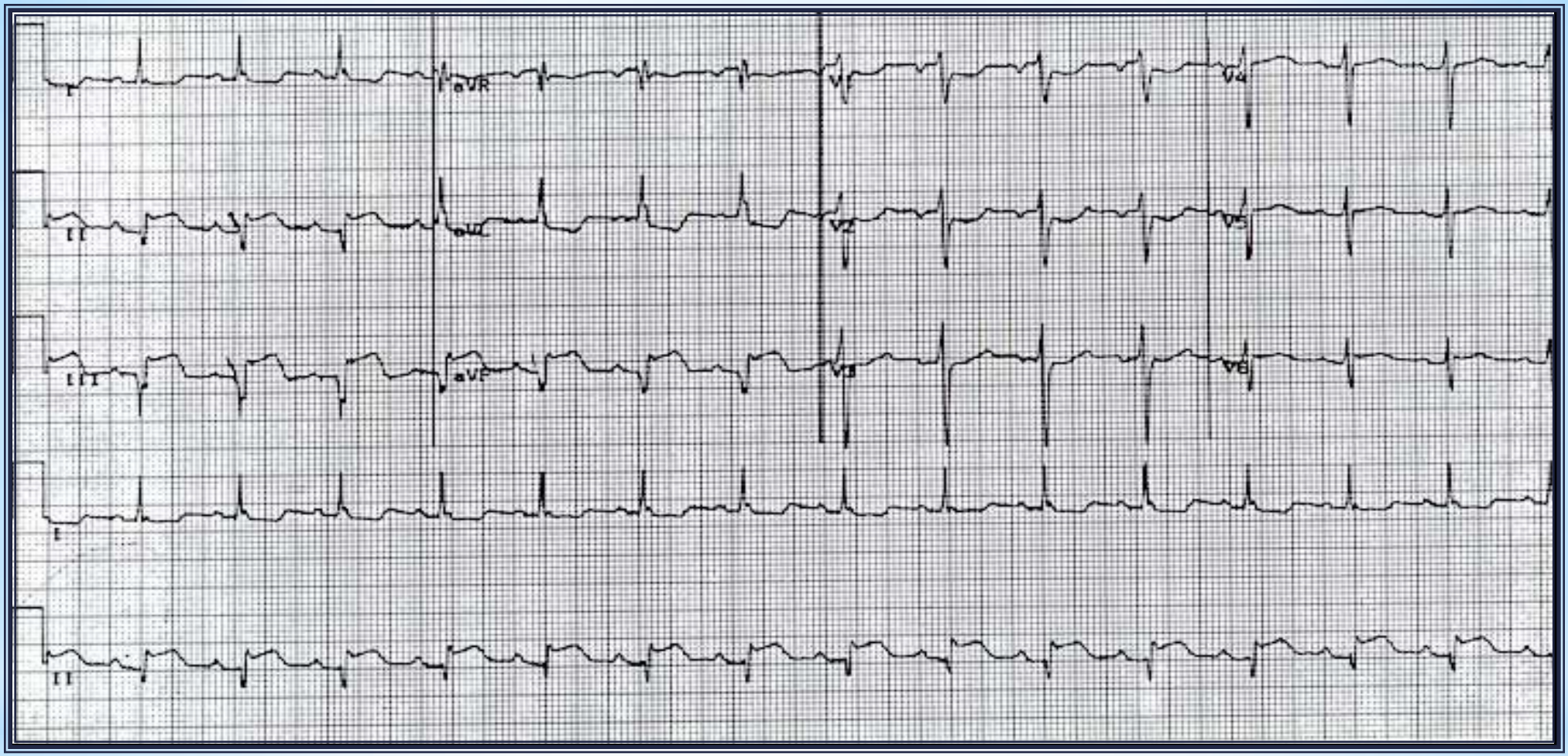


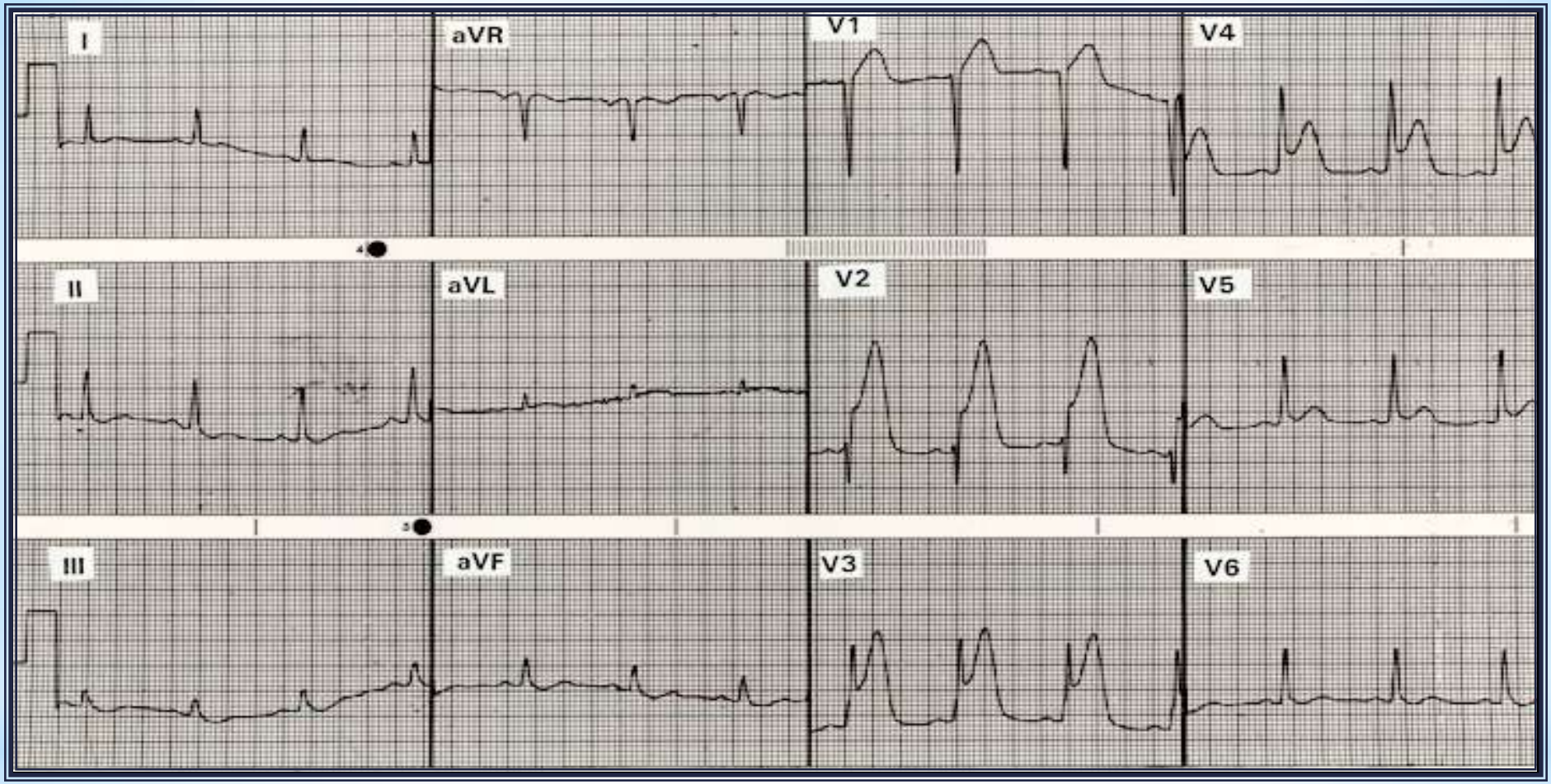
INFERIOR WALL INJURY - STEMI

2/15/2012



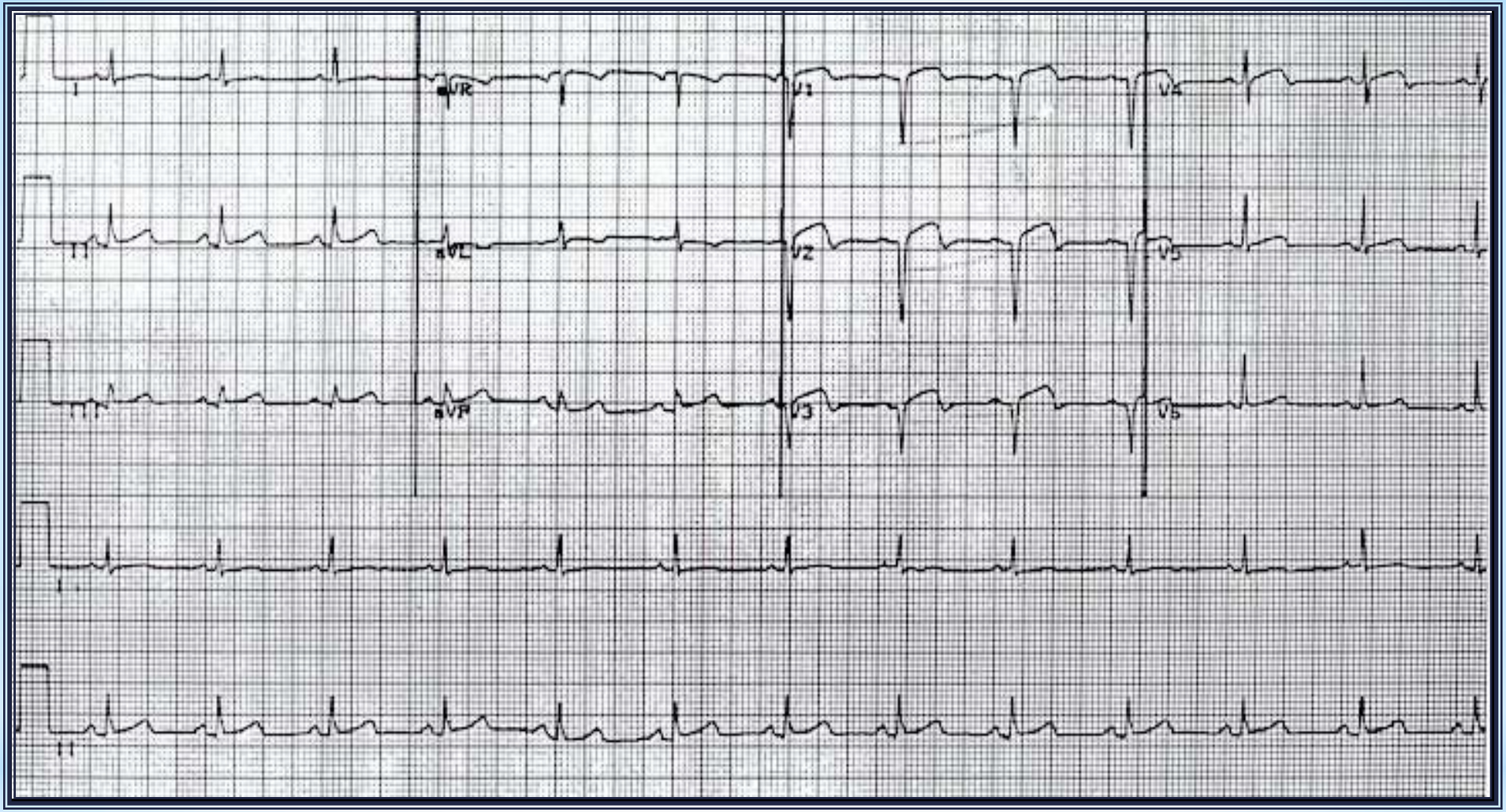
INFERIOR WALL INFARCTION - STEMI

2/15/2012



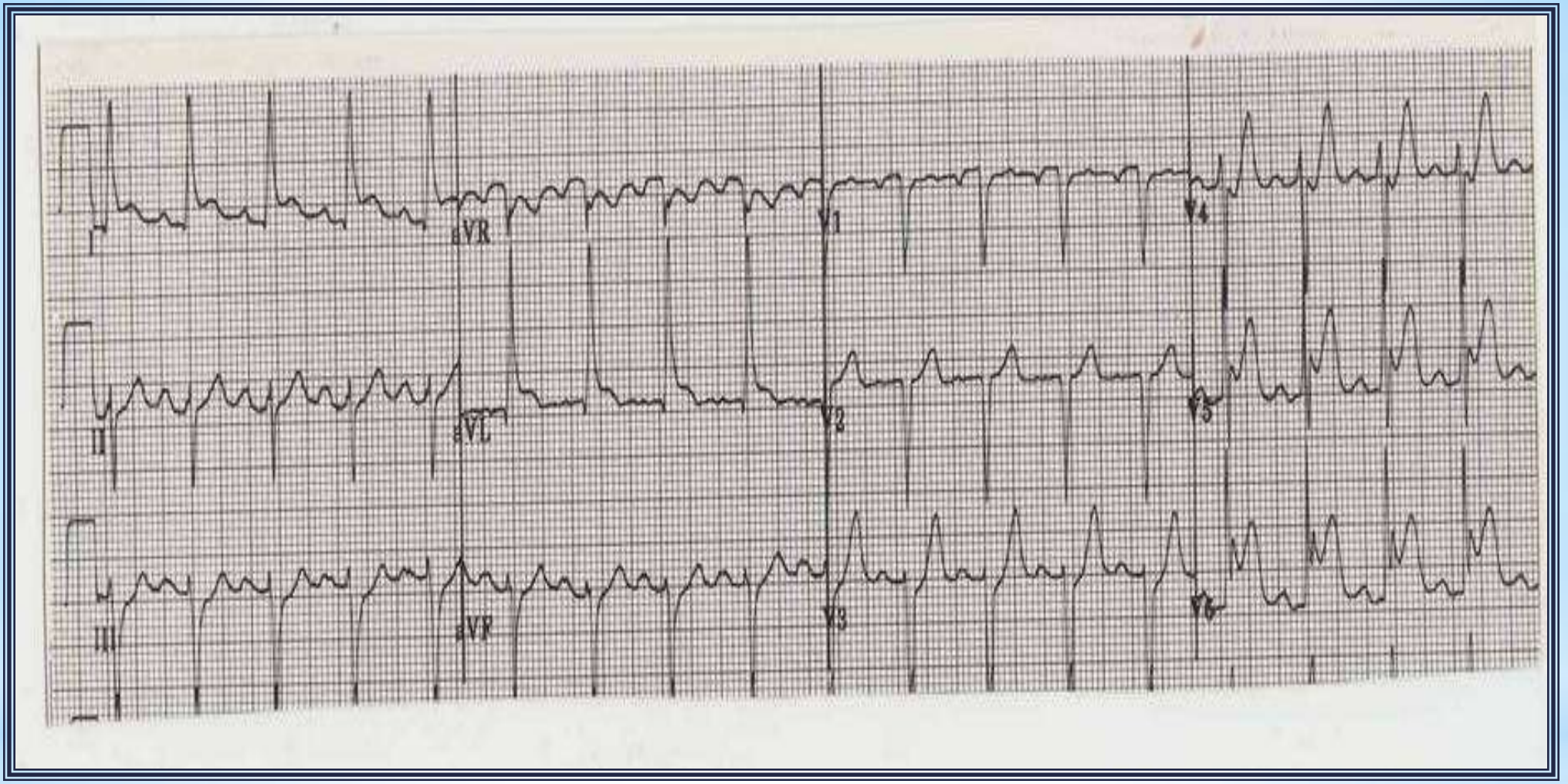
ANTERIOR WALL INJURY - STEMI

2/15/2012



ANTERIOR WALL INFARCTION - STEMI

2/15/2012



LATERAL WALL INJURY - STEMI

2/15/2012

THE UNUSUAL

MYOCARDIAL INFARCTIONS

2/15/2012

50% of Inferior Wall MI'S

15 or 18 Lead ECG'S

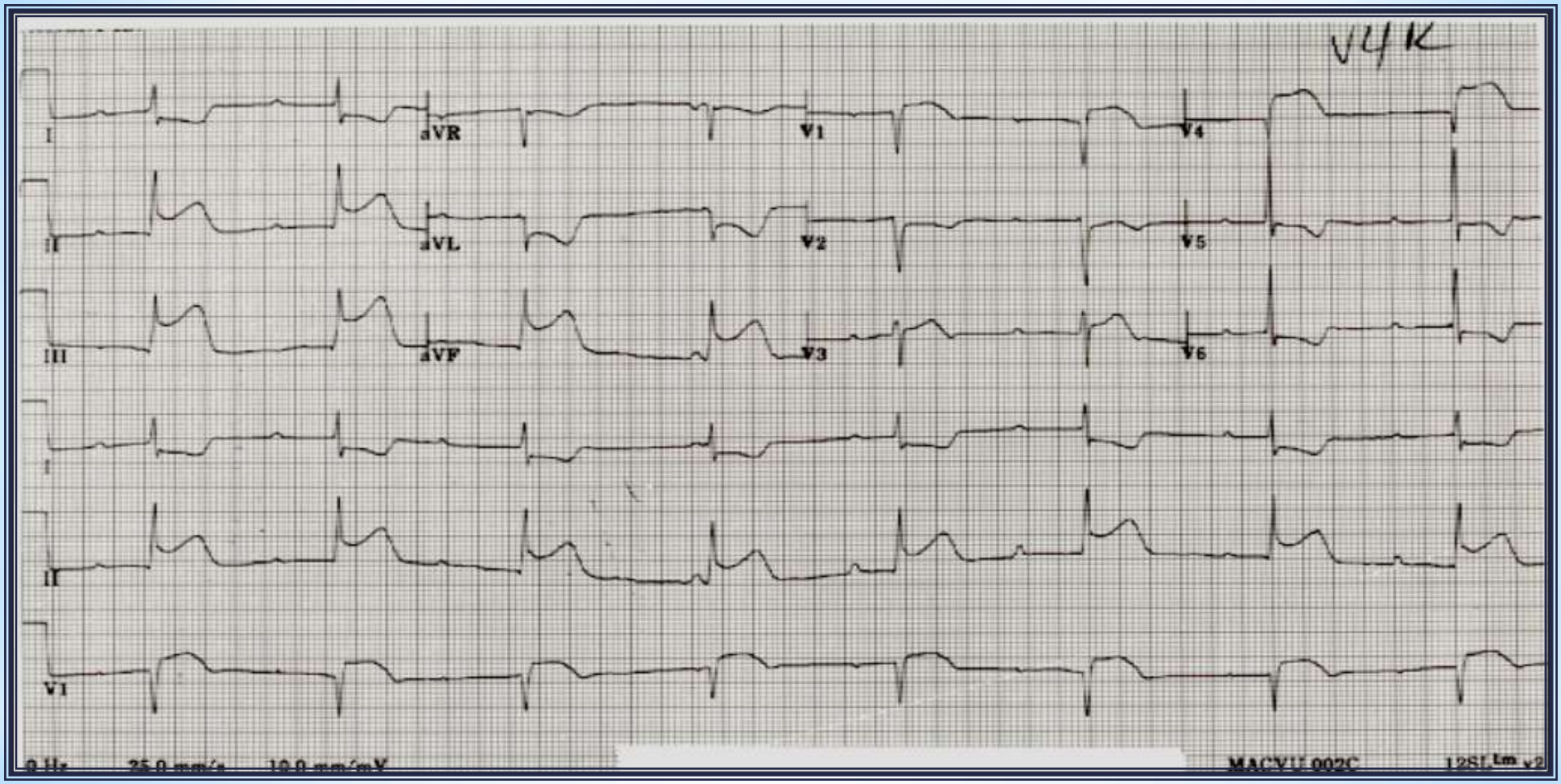
- use V4R Lead

Symptoms

- Hypotension
- Clear BBS

RIGHT VENTRICULAR STEMI

2/15/2012



RIGHT VENTRICULAR WALL STEMI

2/15/2012

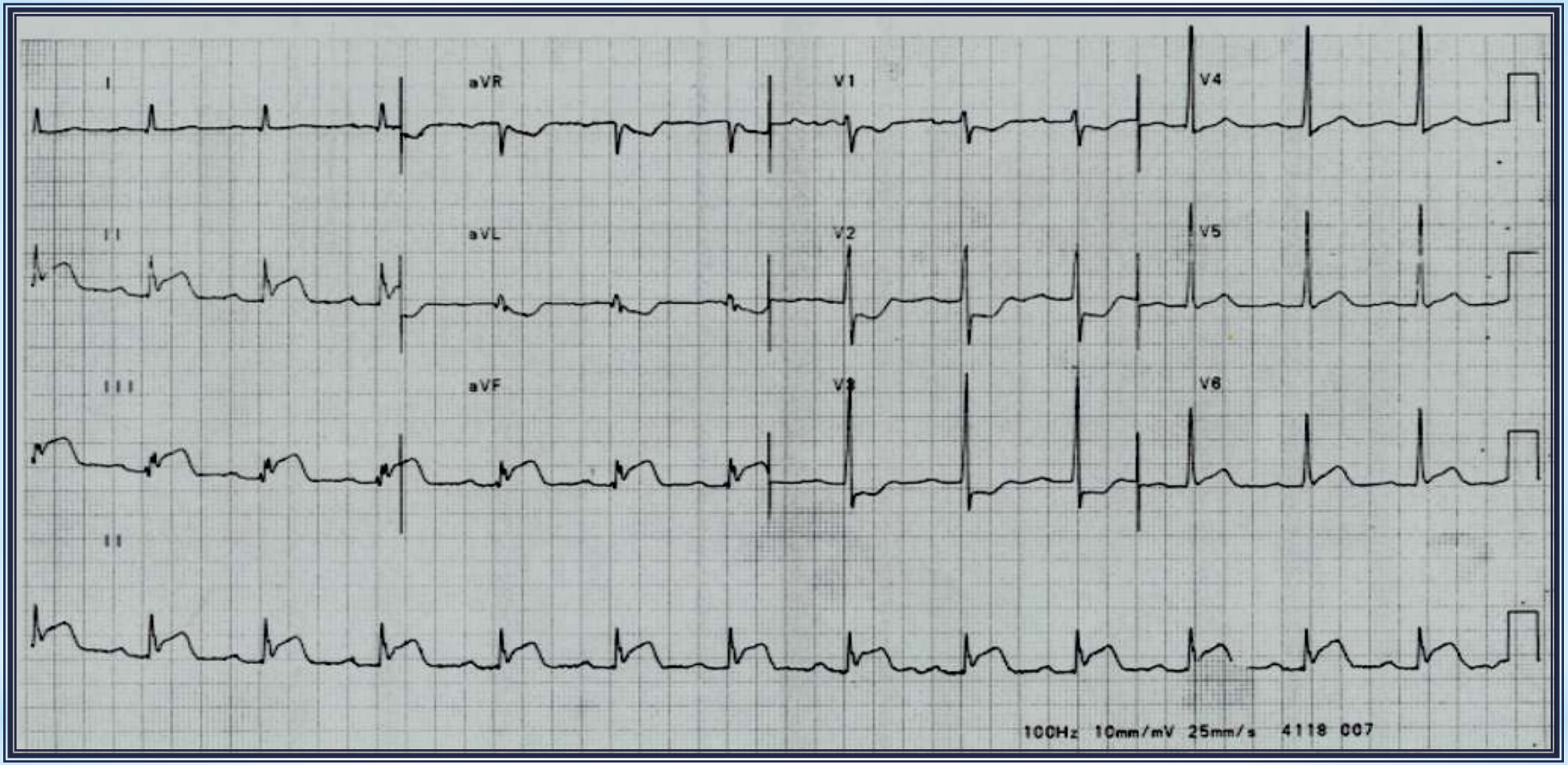
Common / Inferior Wall MI

15 or 18 Lead ECG'S

Field use 12 Lead ECG

- Reciprocal Changes
- V1,V2&V3 Tall R Waves
- ST-T Depression

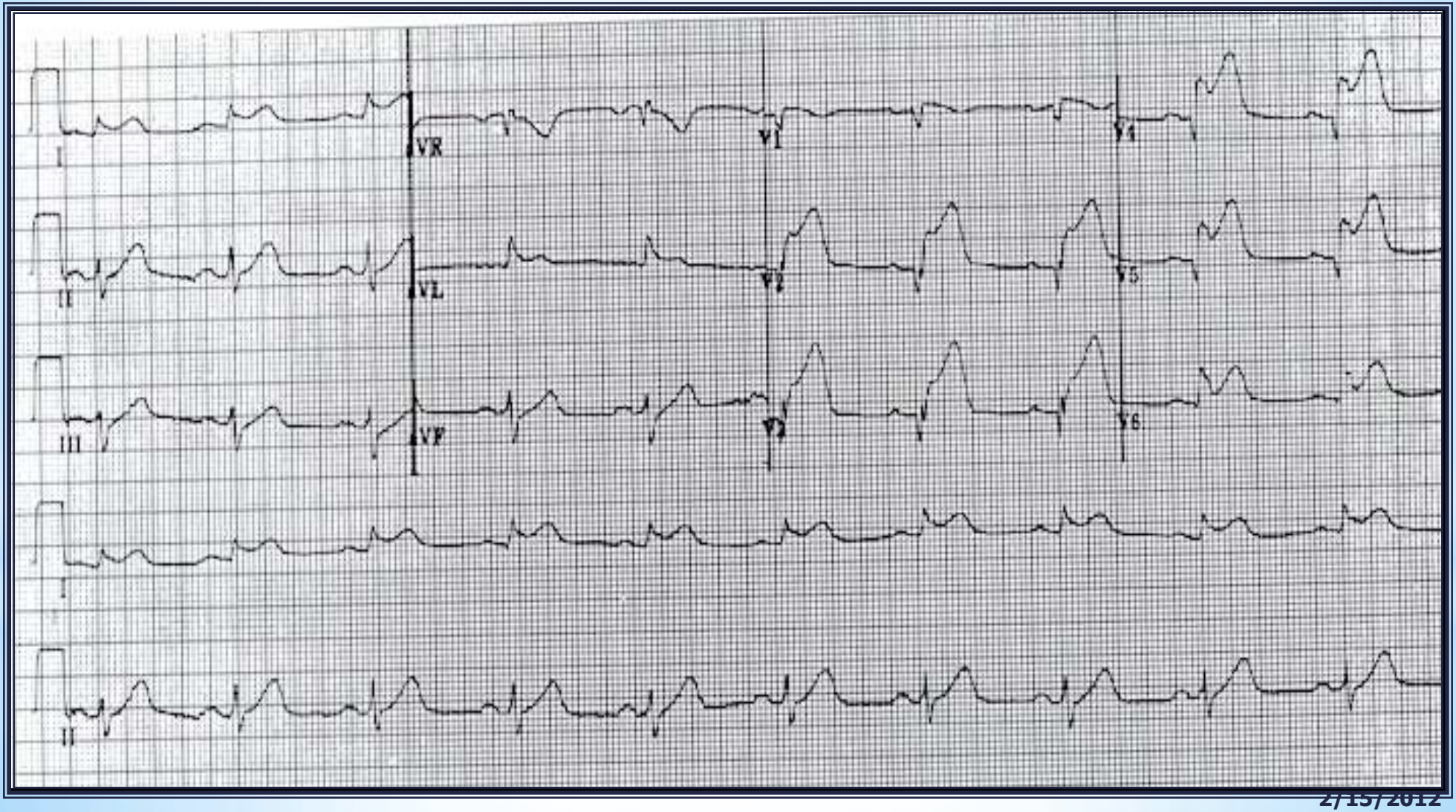
POSTERIOR WALL STEMI



POSTERIOR WALL STEMI

2/15/2012

GLOBAL STEMI



" Sub-***Endocardial*** Wall MI "

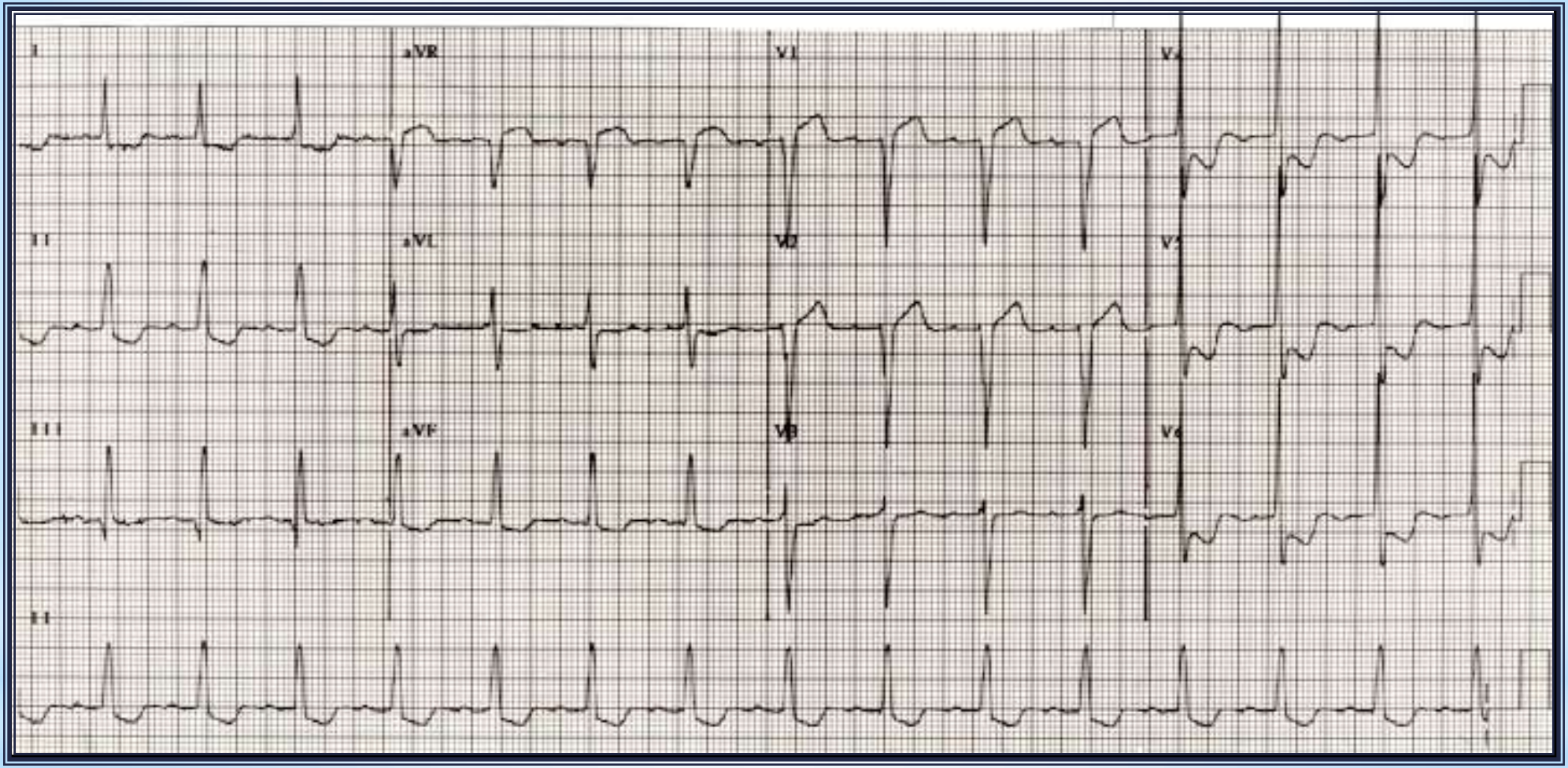
"Non Q Wave MI"

ST-T Wave Depressions

Symptoms & Treatment

NON STEMI MI

2/15/2012



NON STEMI MI

2/15/2012

Acute Pericarditis

Early Repolarization

Left Ventricular Hypertrophy

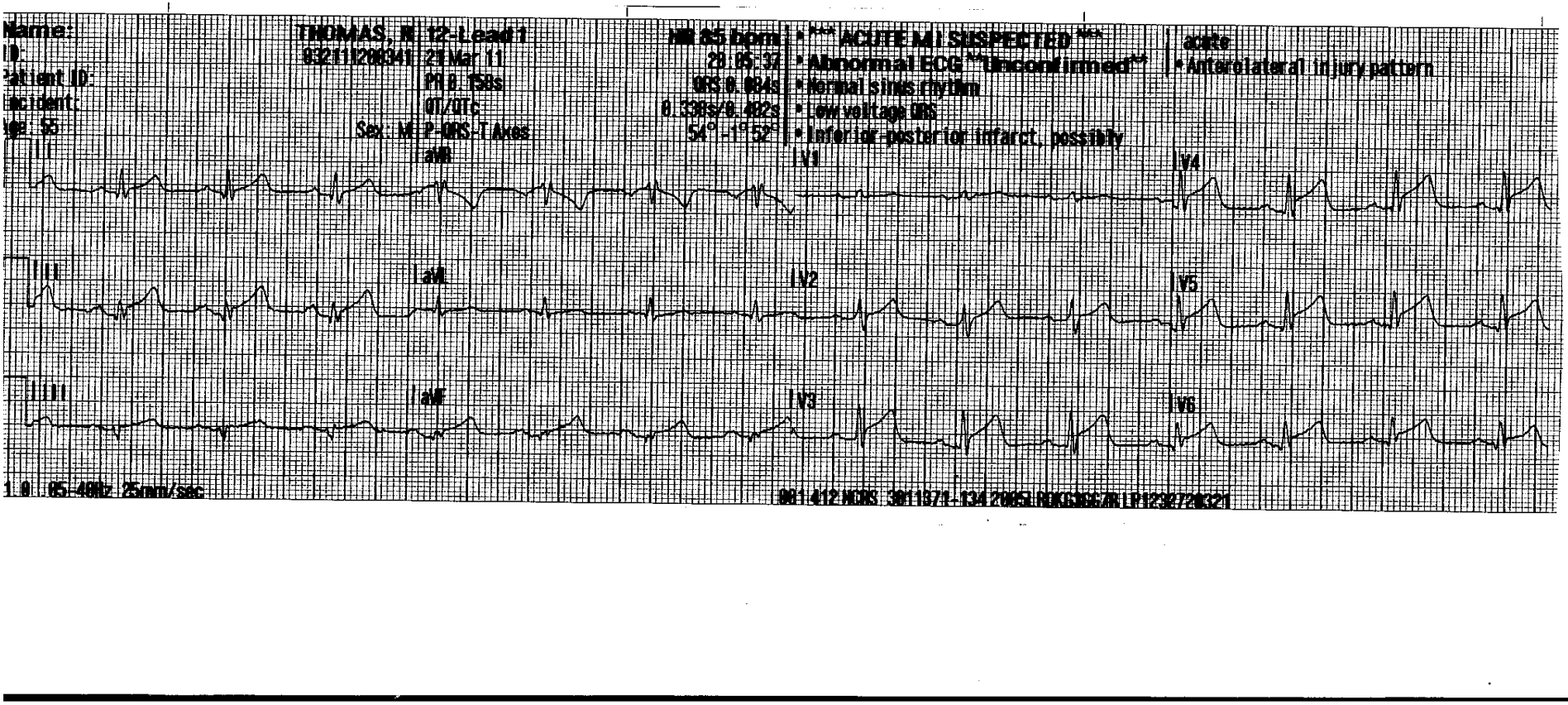
Left Bundle Branch Block

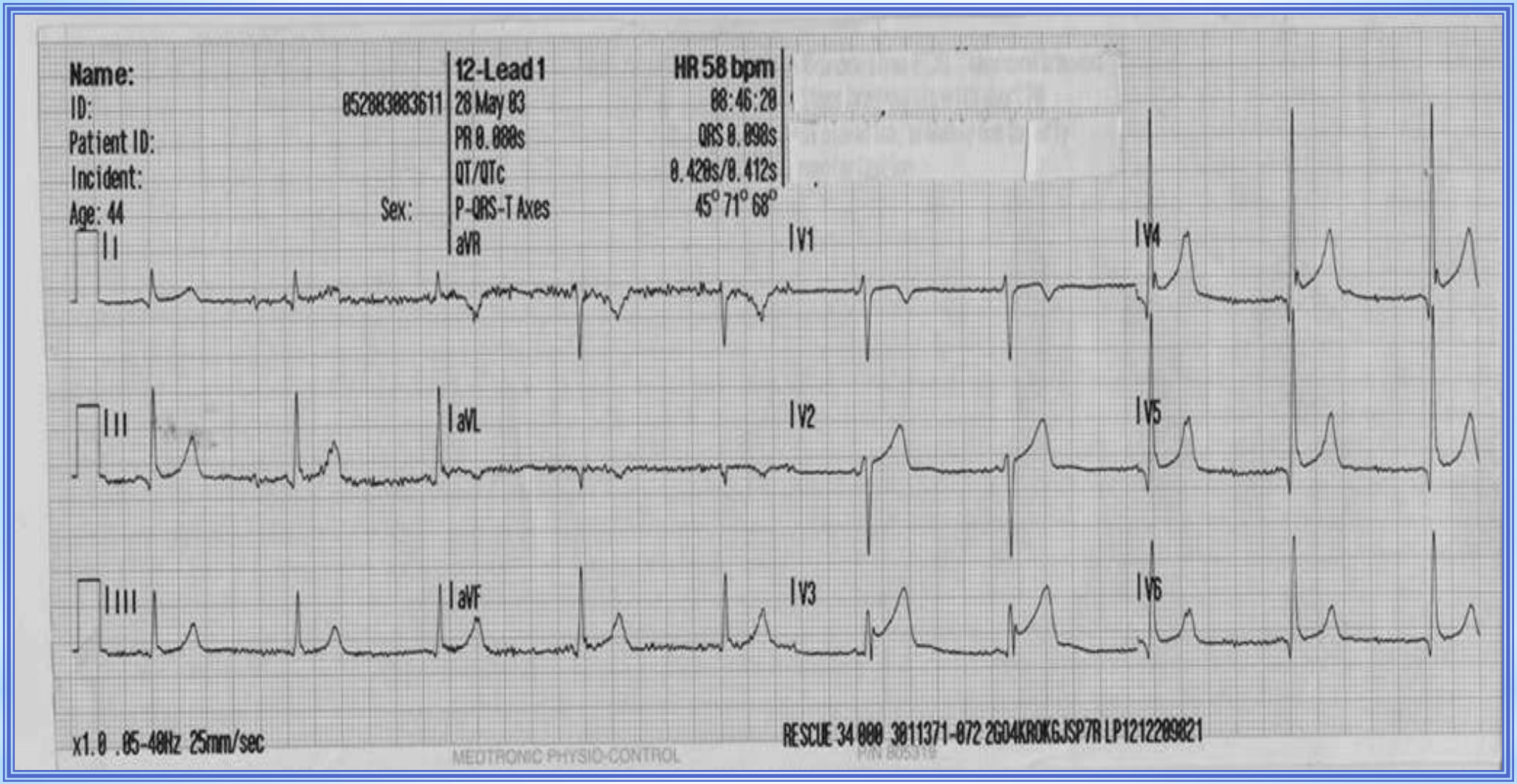
Ventricular Pacemakers

Ventricular Rhythms

THE GREAT MIMICS

ACUTE PERICARDITIS





EARLY REPOLARIZATION

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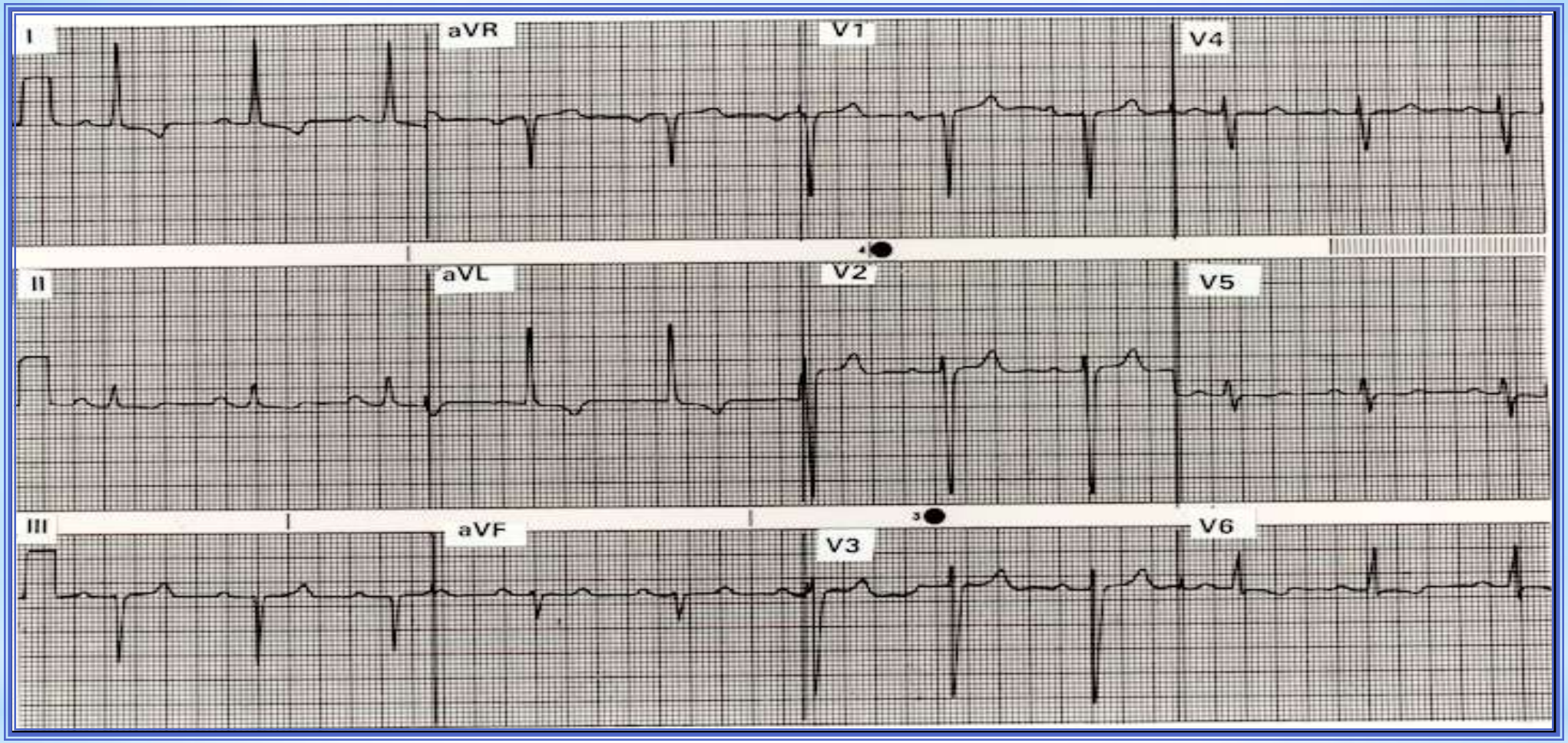
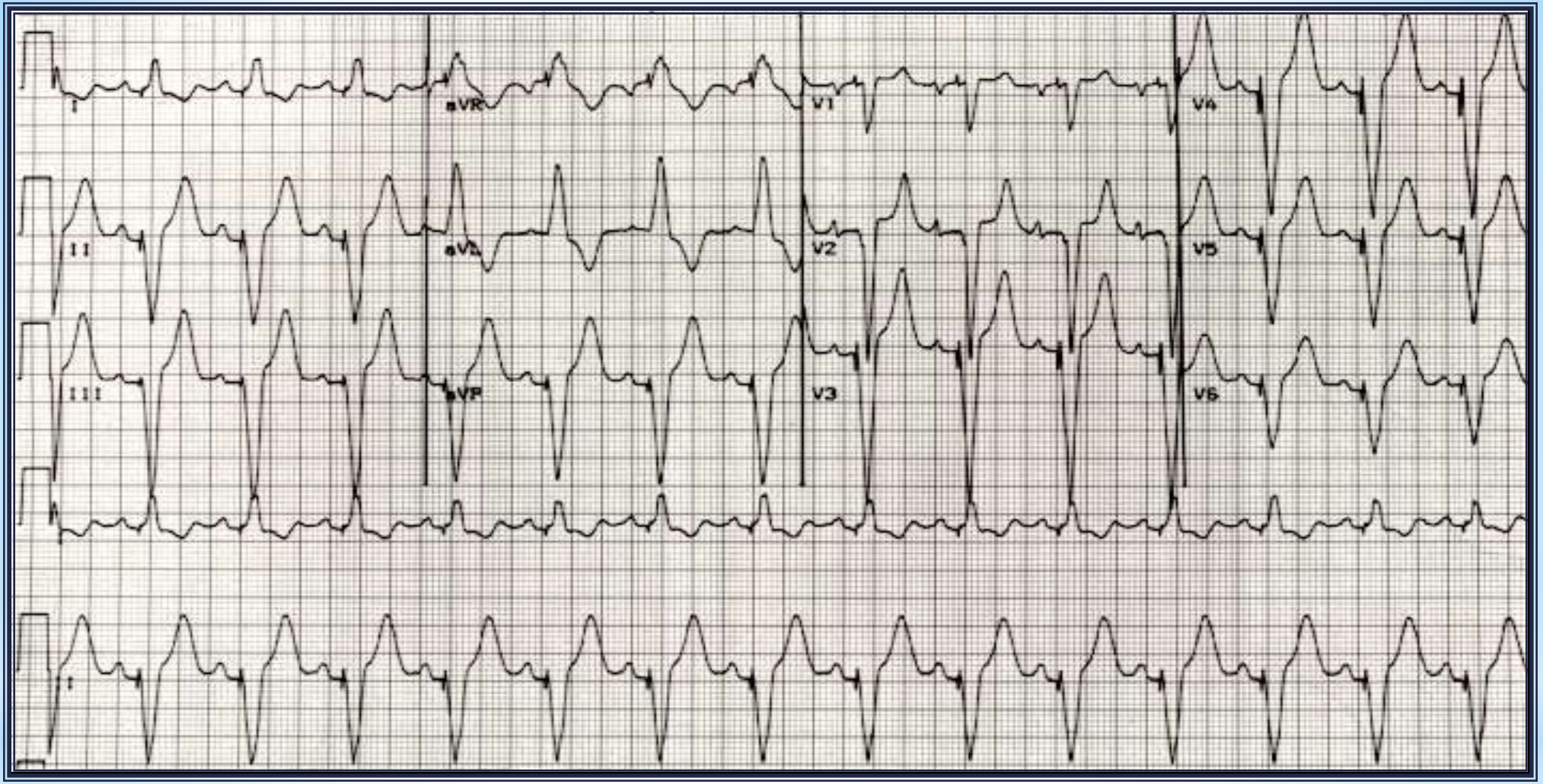


LEFT VENTRICULAR HYPERTROPHY

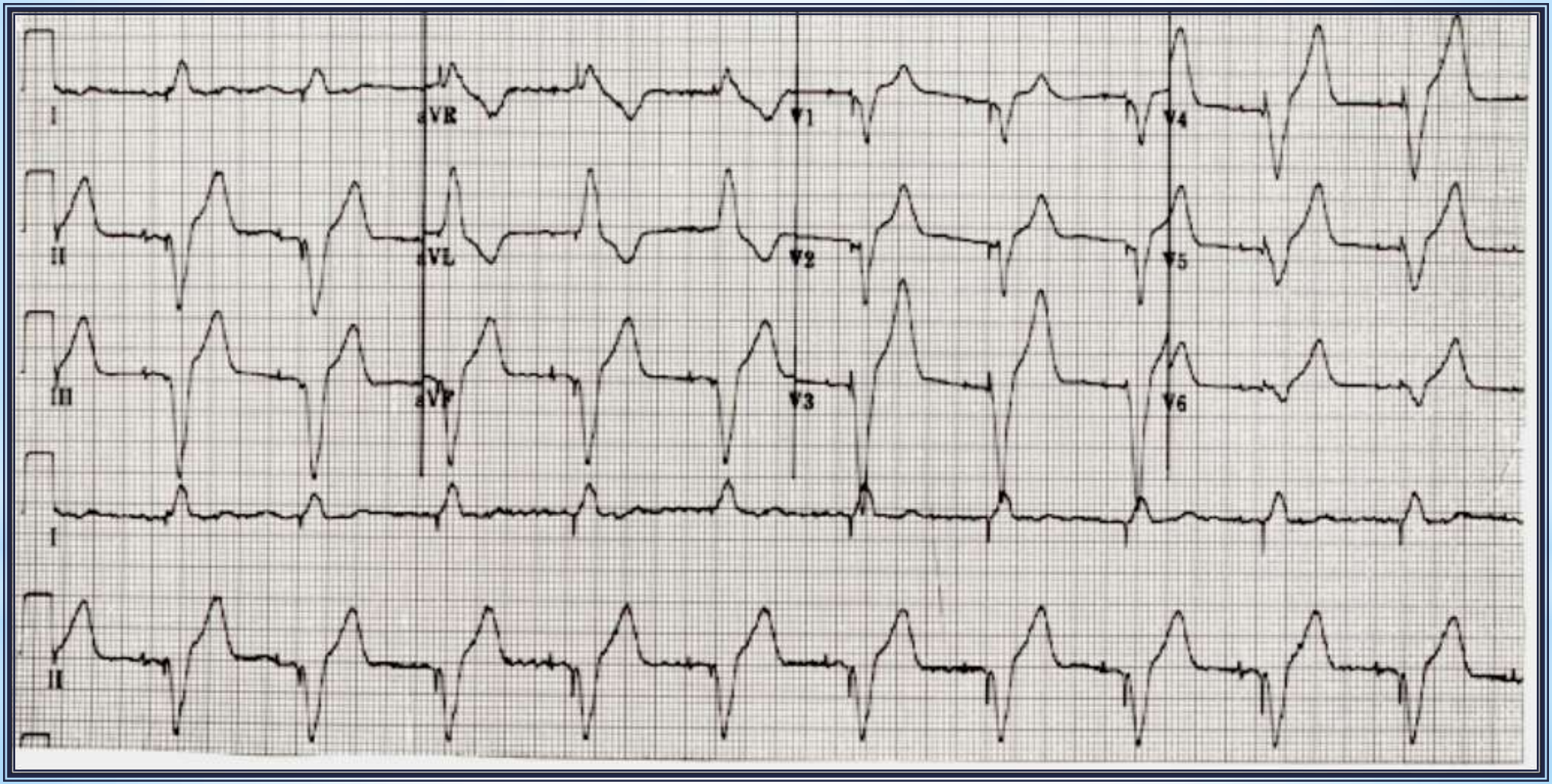
2/15/2012



VENTRICULAR PACEMAKER

2/15/2012

AV PACEMAKER



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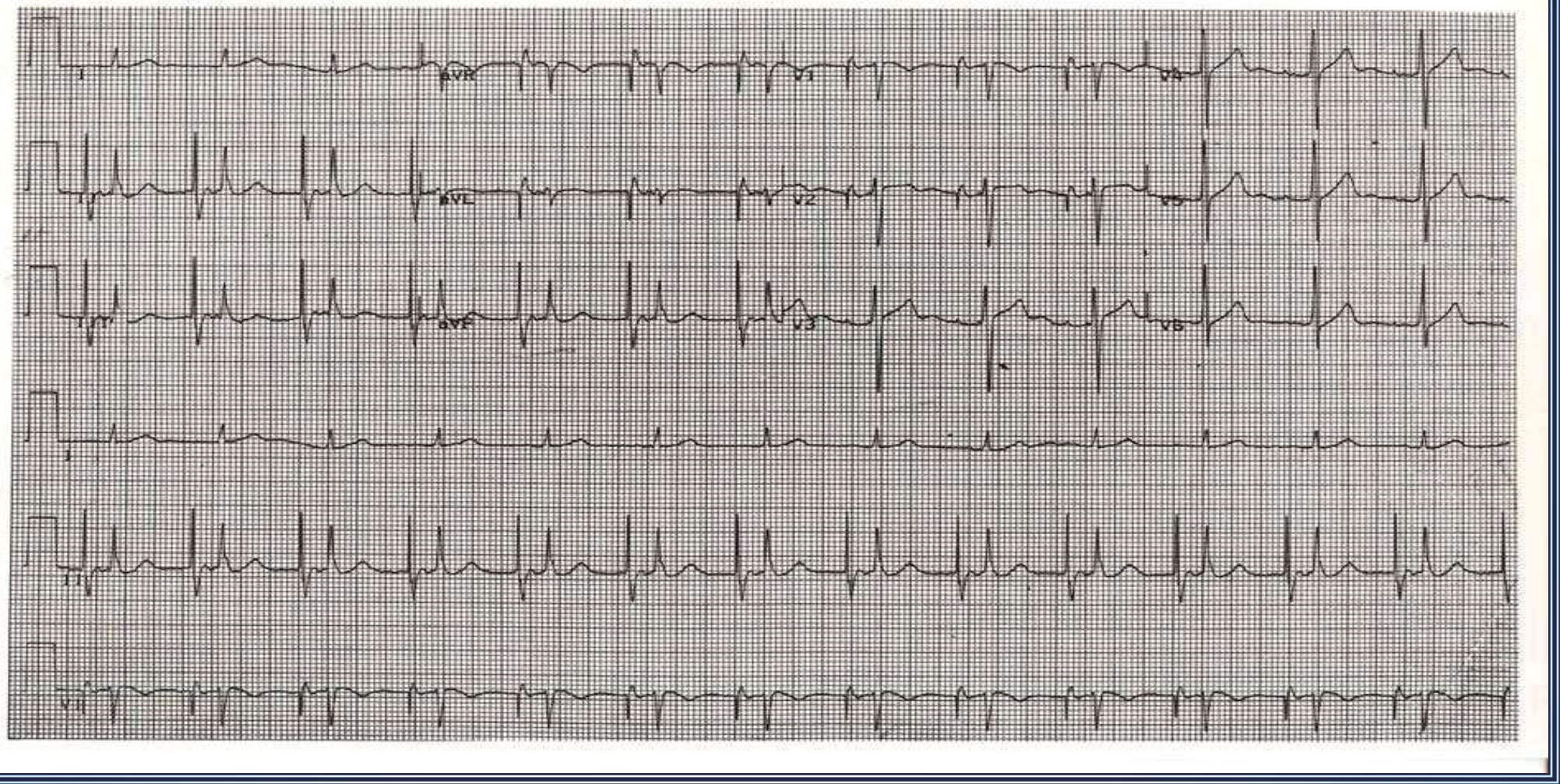


ATRIAL PACEMAKER

2/15/2012

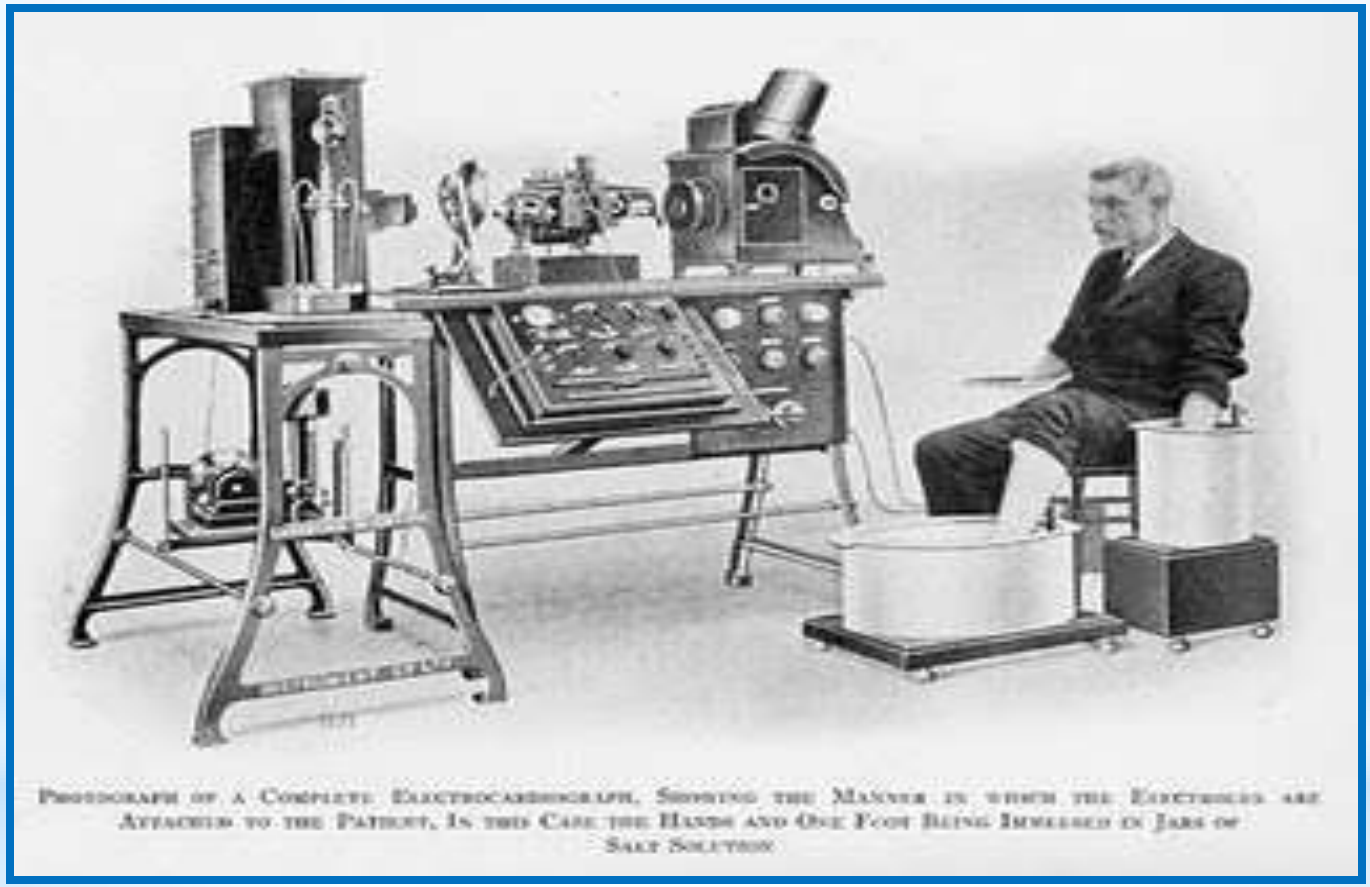
ELECTRICAL AXIS

THE THEORY OF ELECTRICITY

CAUSES OF AXIS DEVIATION

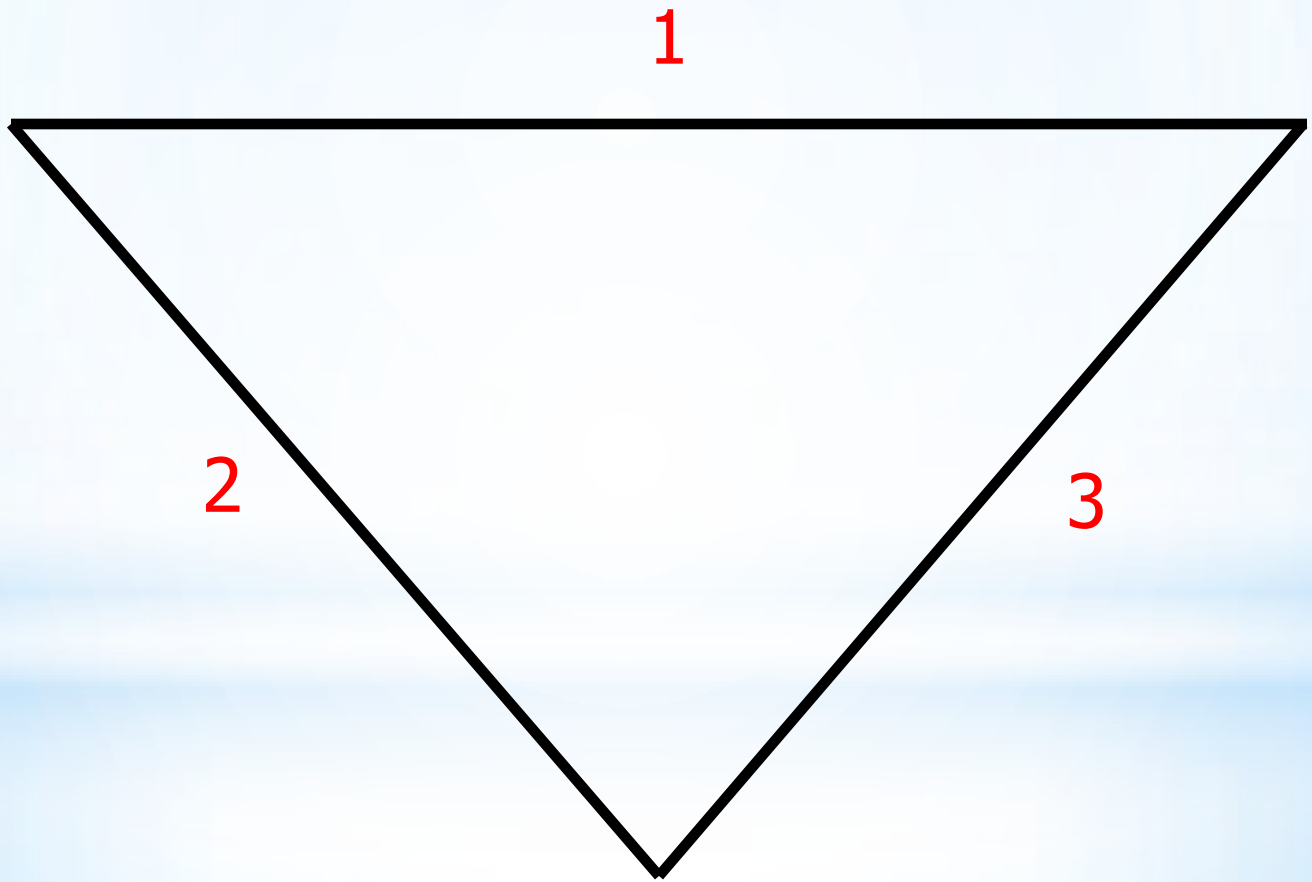
- LAD
  - **Inferior Wall STEMI**
  - **Bi-Fascicular Block**
  - V-TACH
  - COPD
  - WPW
  - BBB
  - LVH
  - RV PACING
  - K + OD
- RAD
  - **Anterior Lateral STEMI**
  - **Bi-Fascicular Block**
  - V-TACH
  - COPD
  - WPW
  - BBB
  - RVH
  - P Embolus
  - Dextrocardia

“DR. EINTHOVEN I PRESUME”

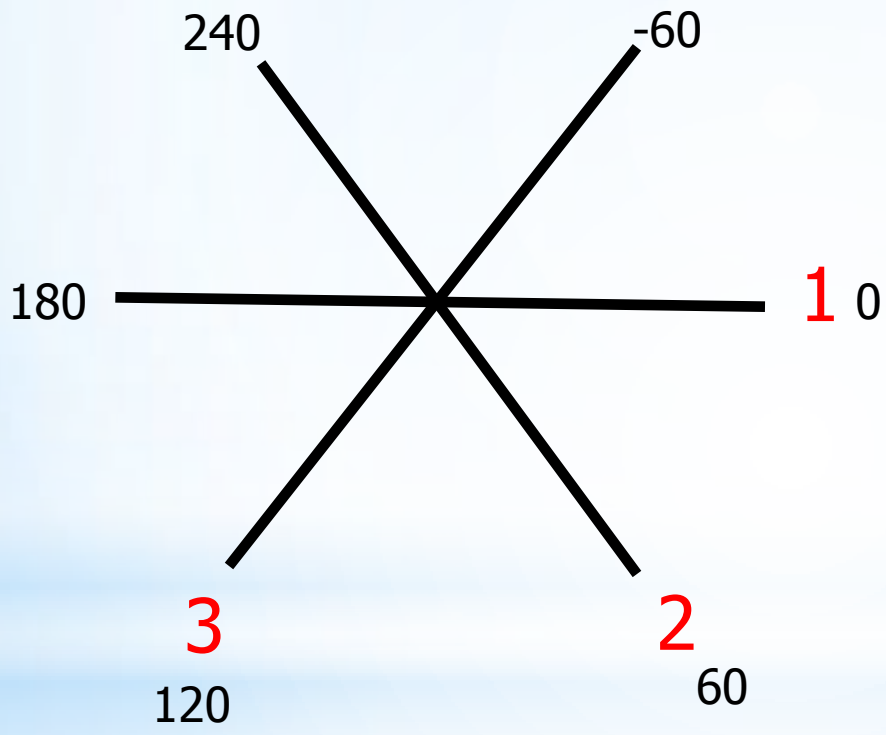


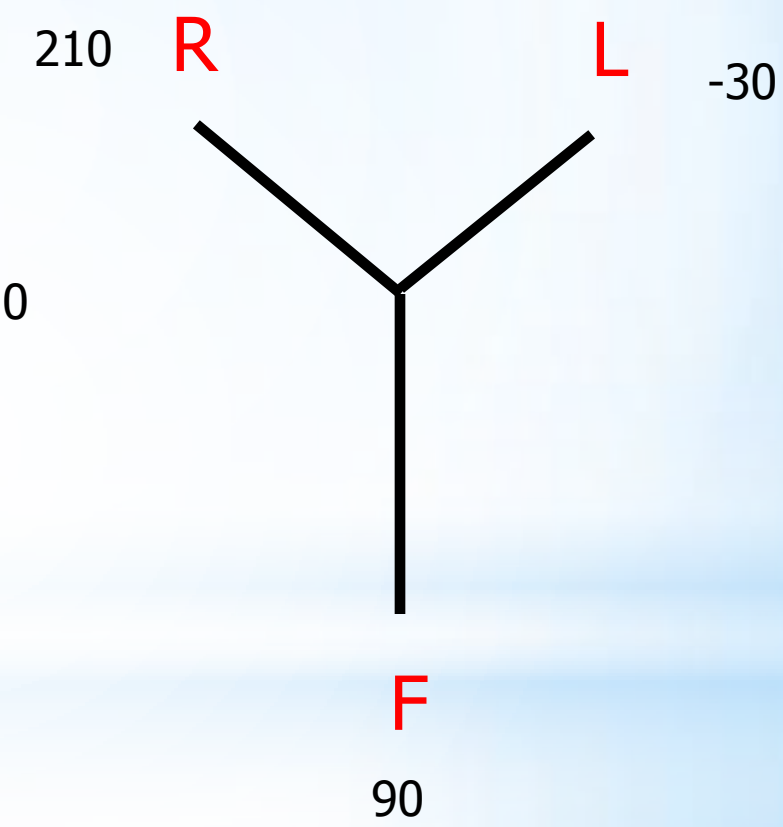
Photograph of a Complete Electrocardiograph, Showing the Manner in which the Electrodes are Attached to the Patient, In this Case the Hands and One Foot Being Immersed in Jars of Salt Solution

EINTHOVENS TRIANGLE

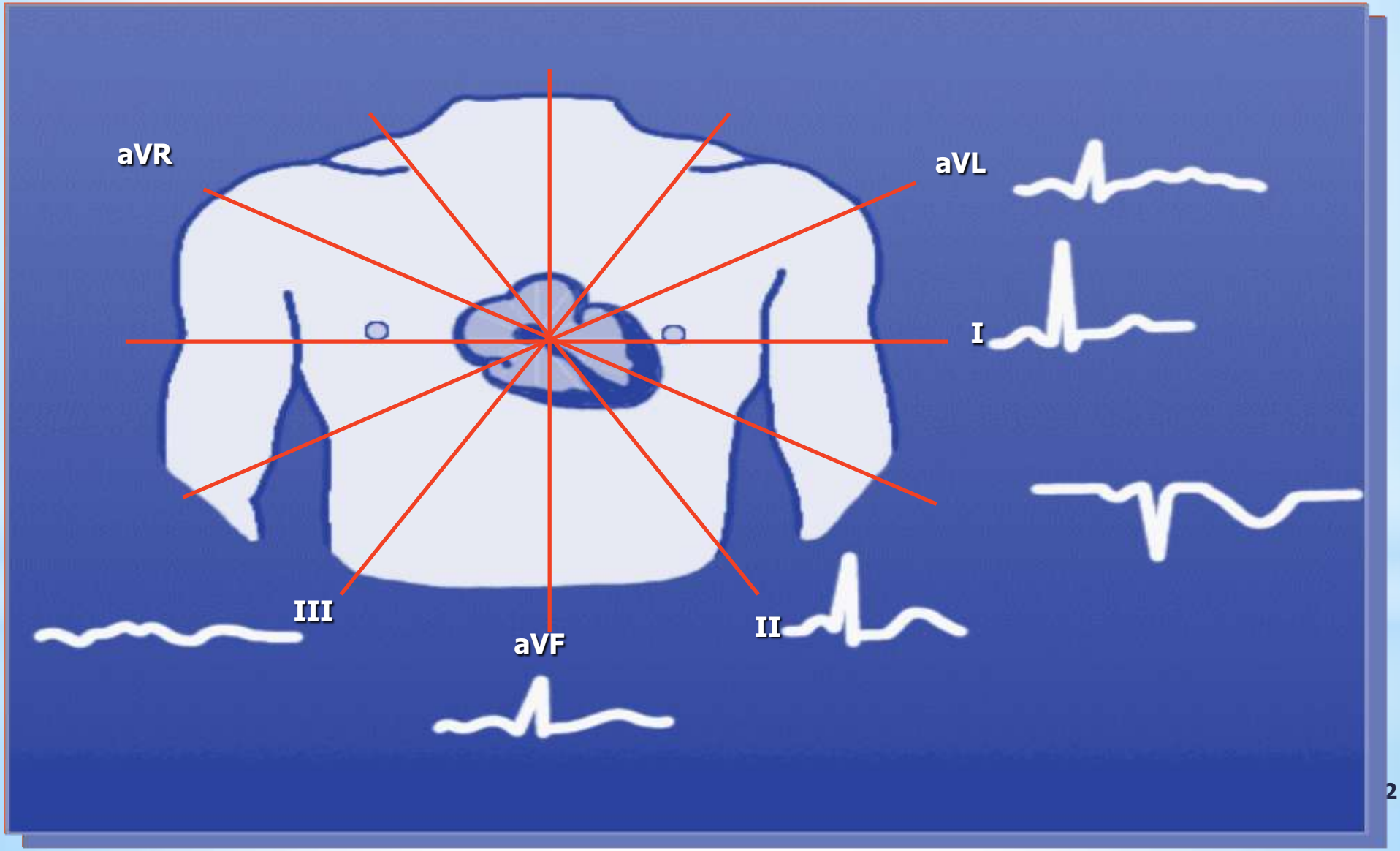


IMPORTANT RELATIONSHIPS

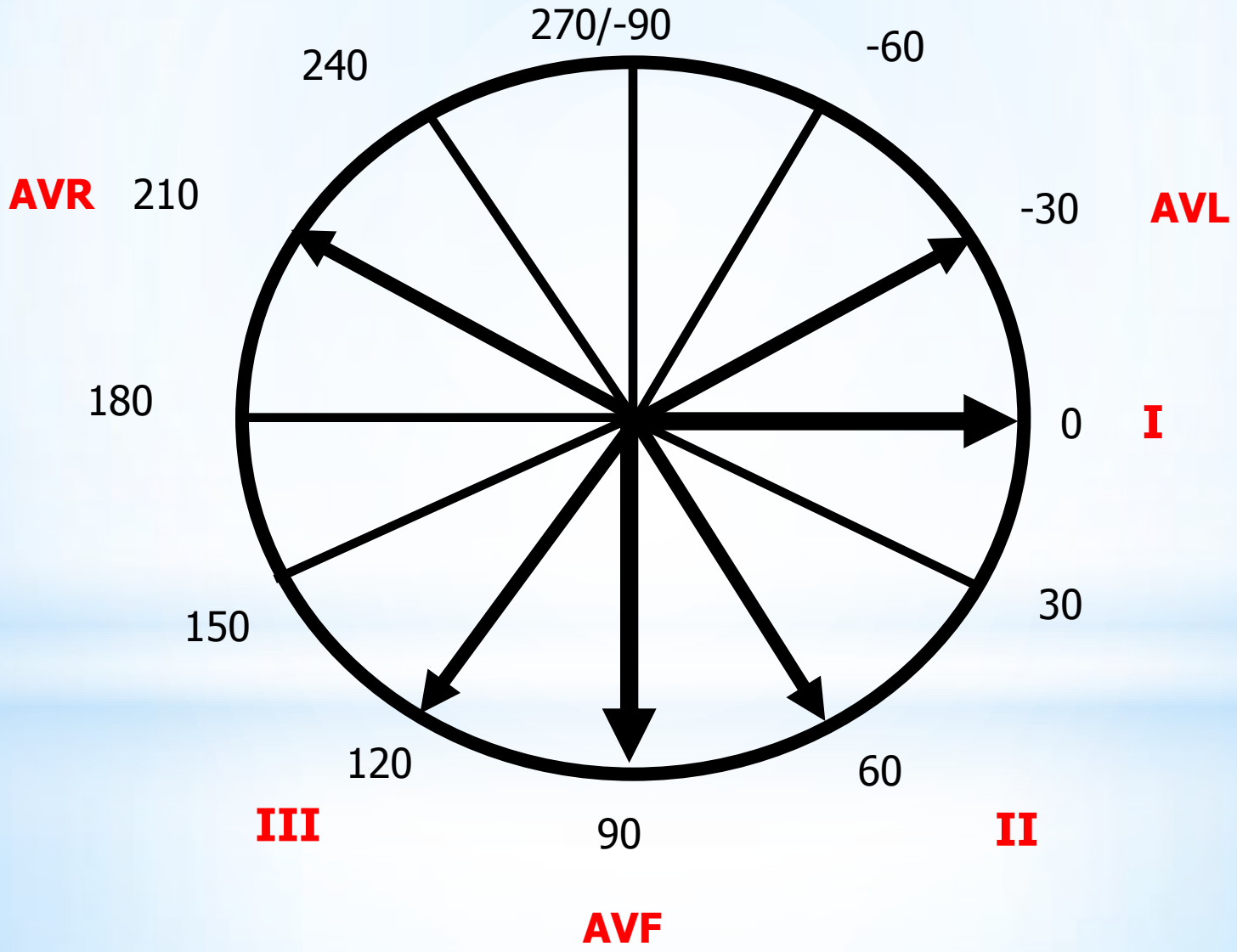




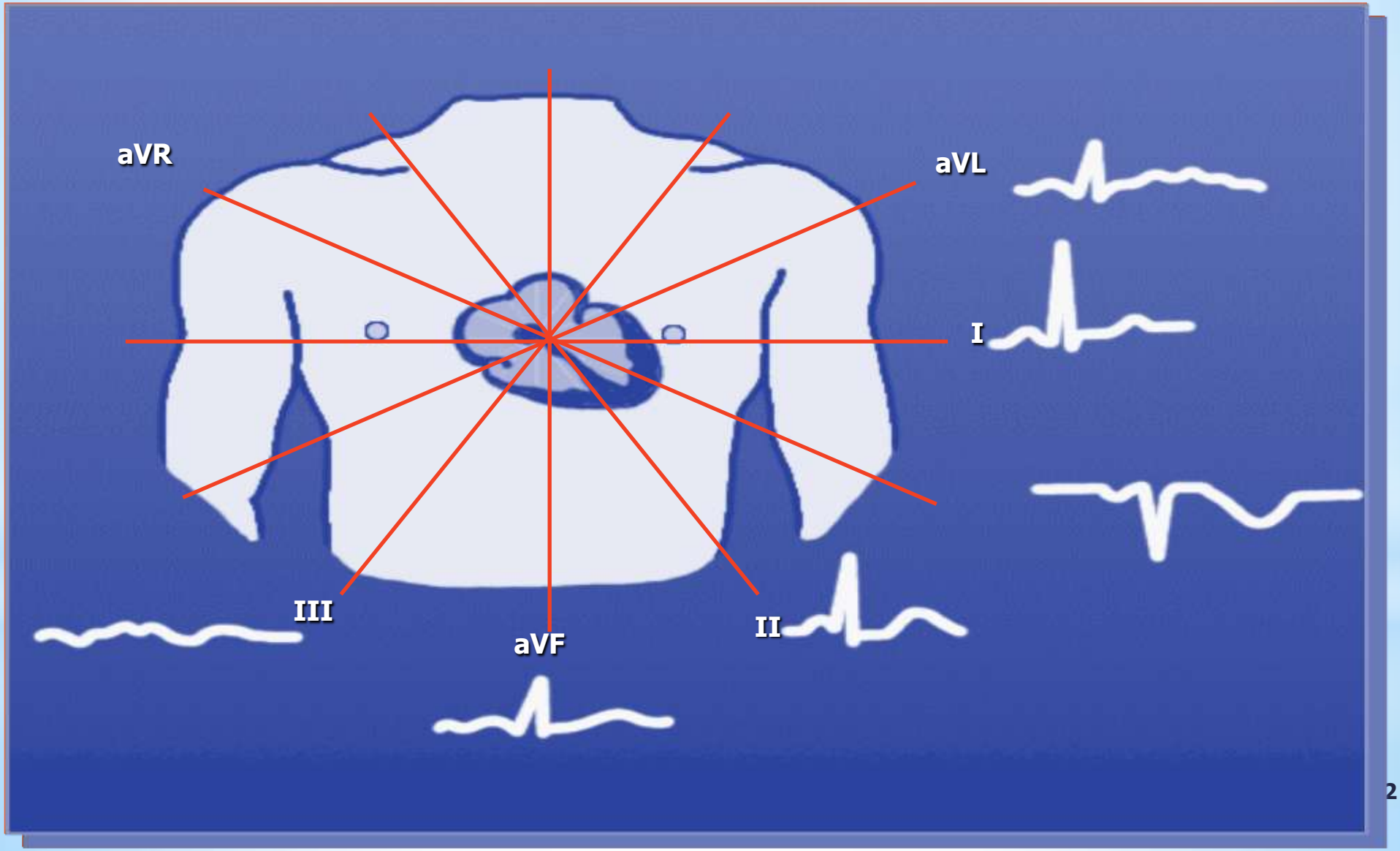
Limb Lead Axis



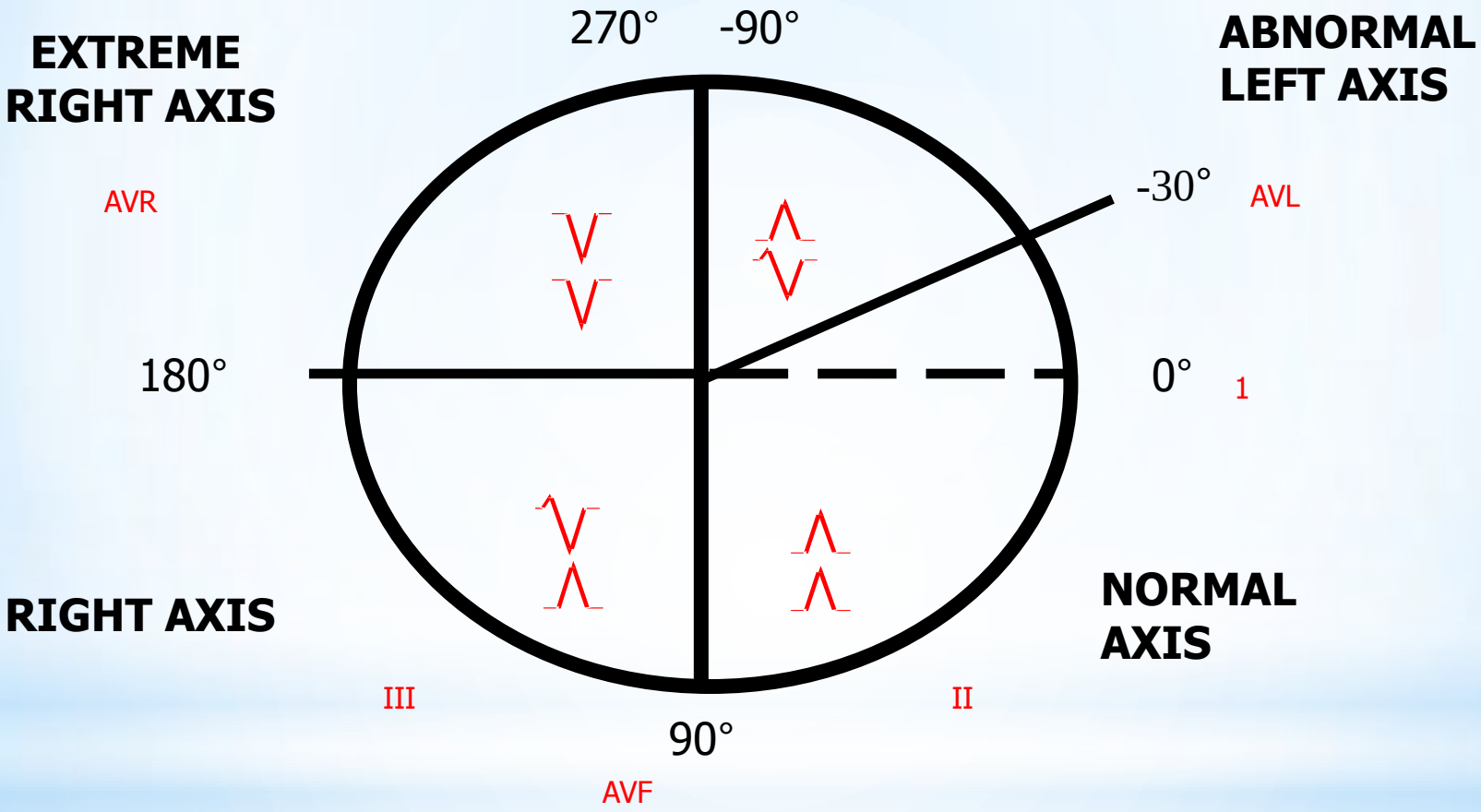
AXIS REFERENCE DIAGRAM



Limb Lead Axis

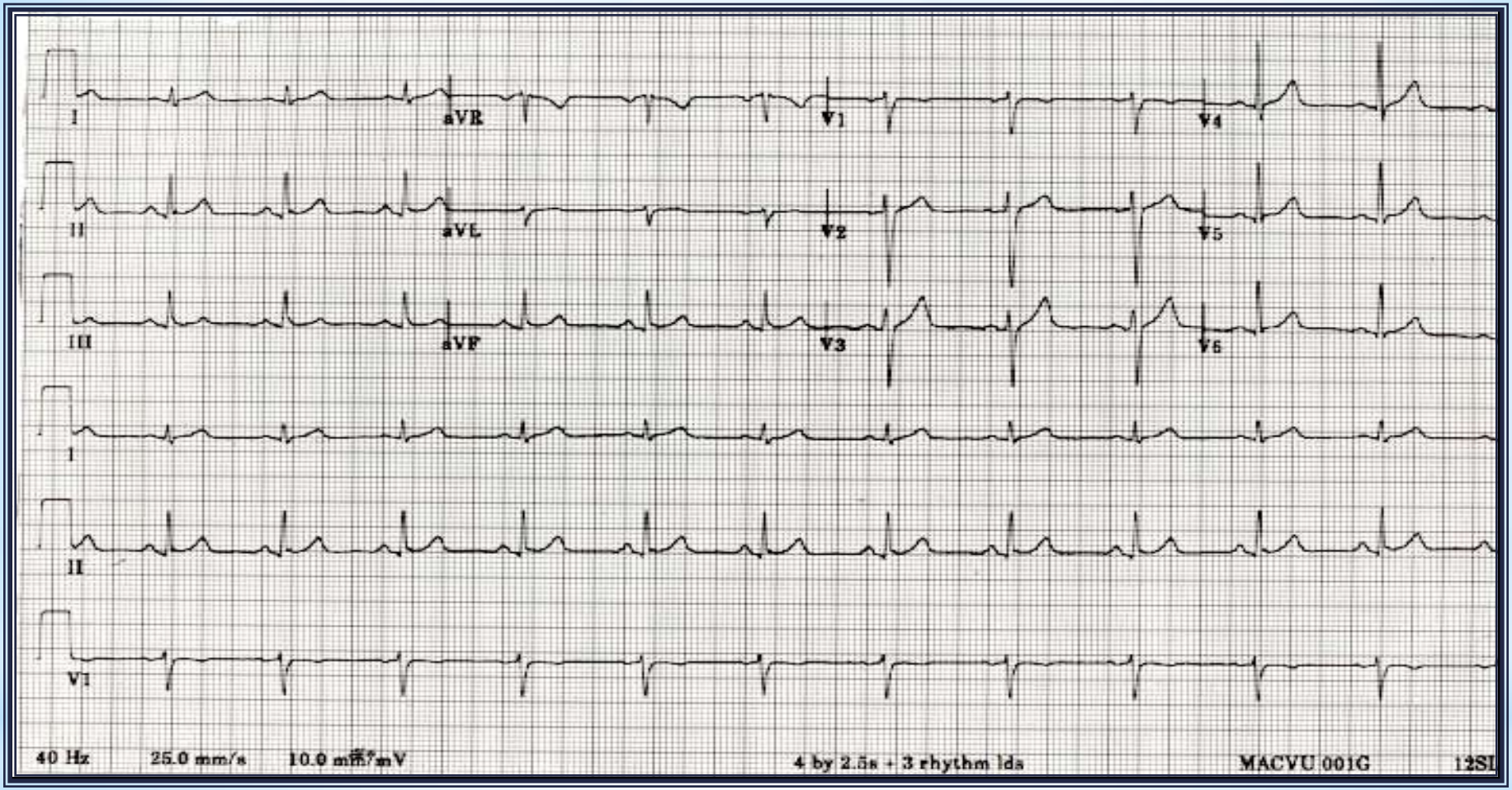


QUADRANT SYSTEM



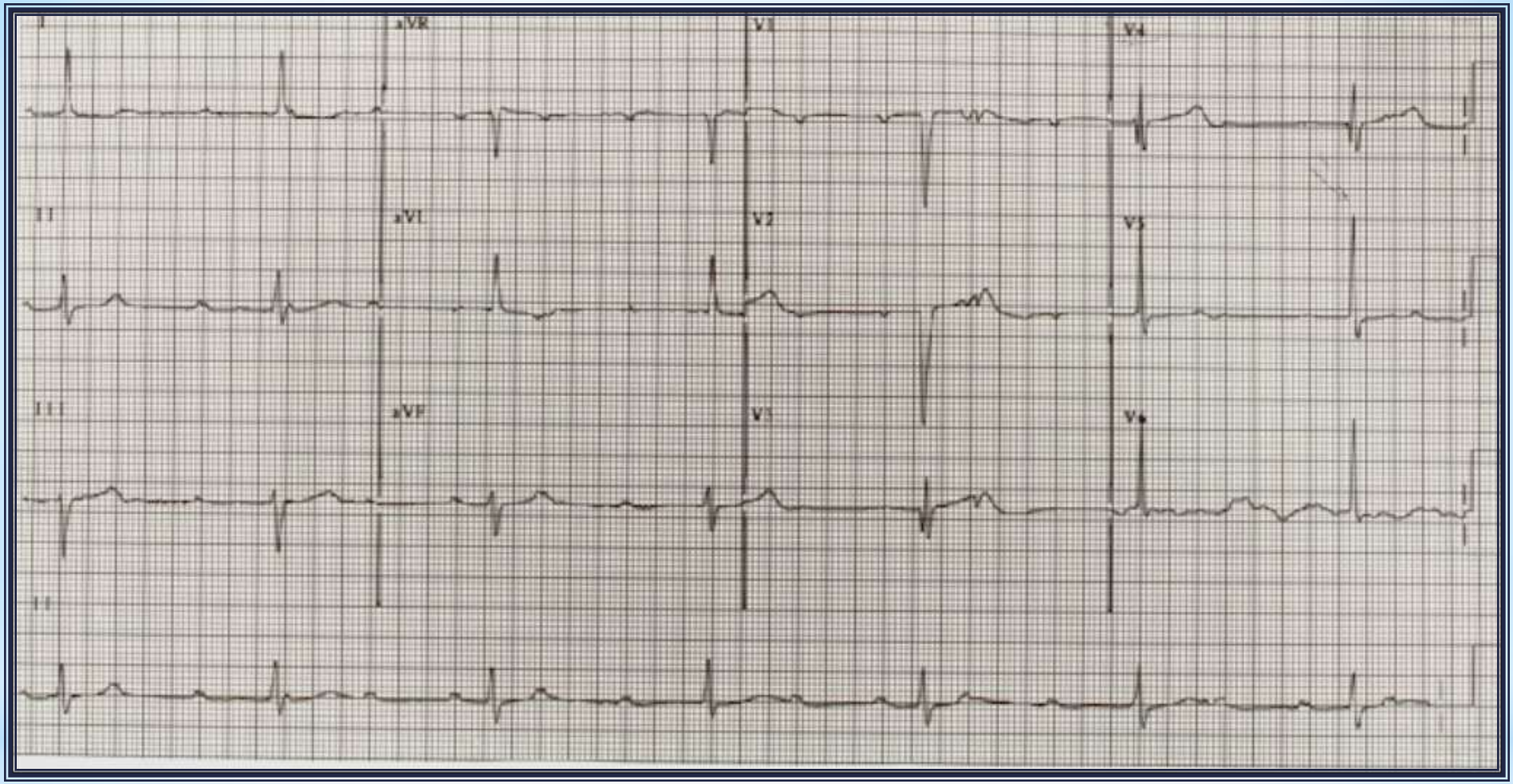
-***Leads I, AVF***
QRS

	NORMAL	ABN LEFT	RIGHT	ABN. RT.
I	+	+	–	–
AVF	+	–	+	–



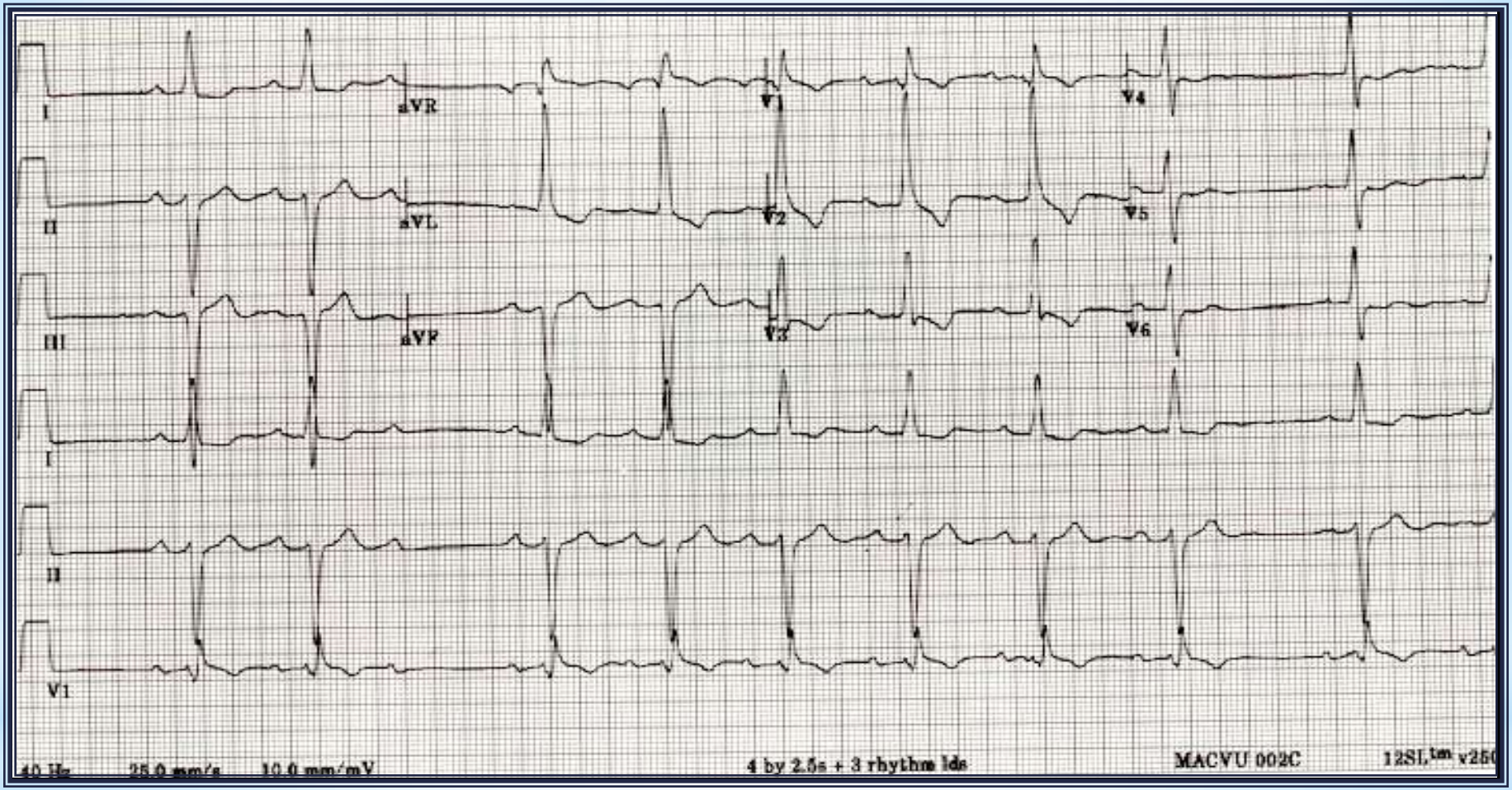
AXIS 1

2/15/2012



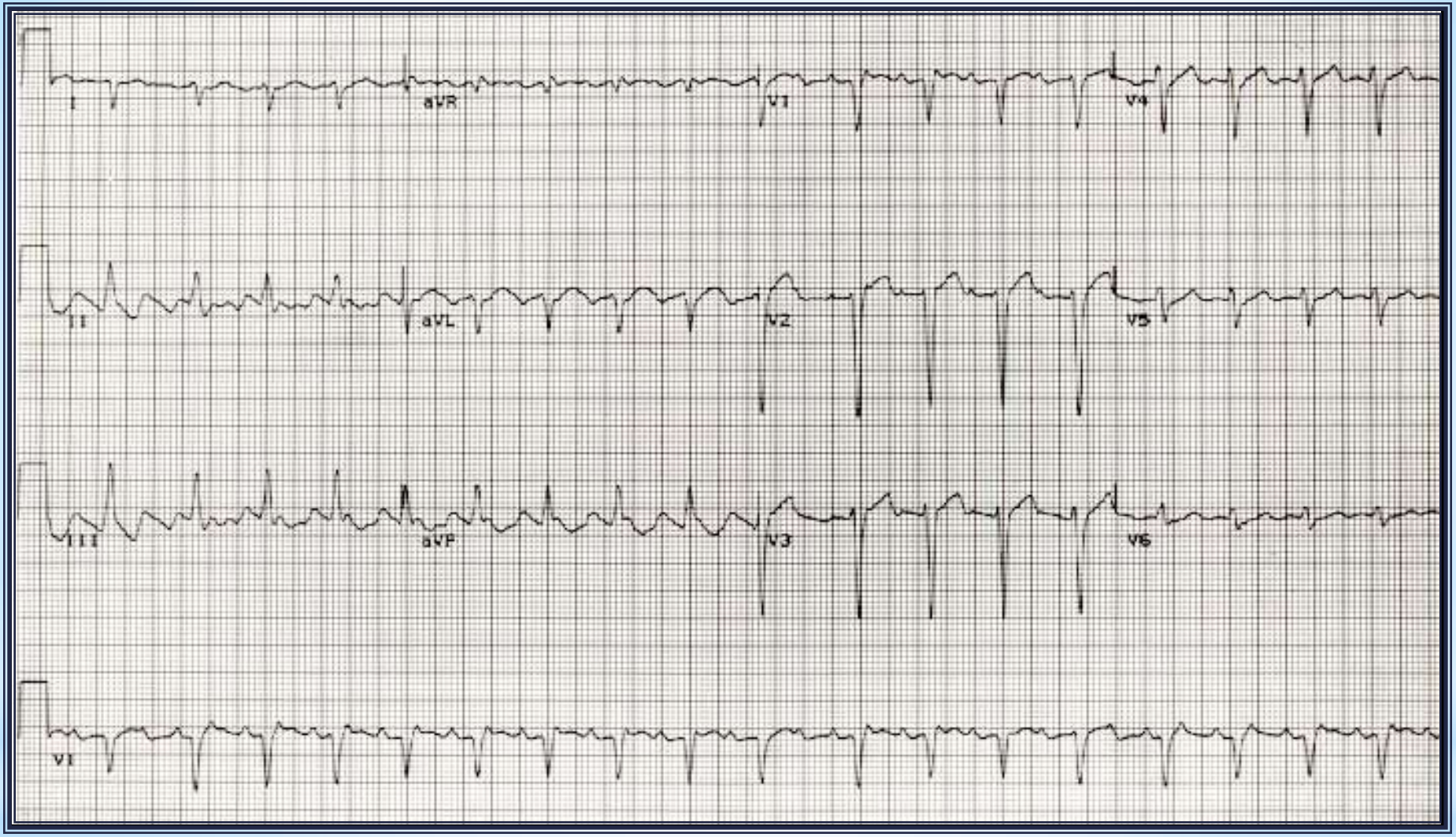
AXIS 2

2/15/2012



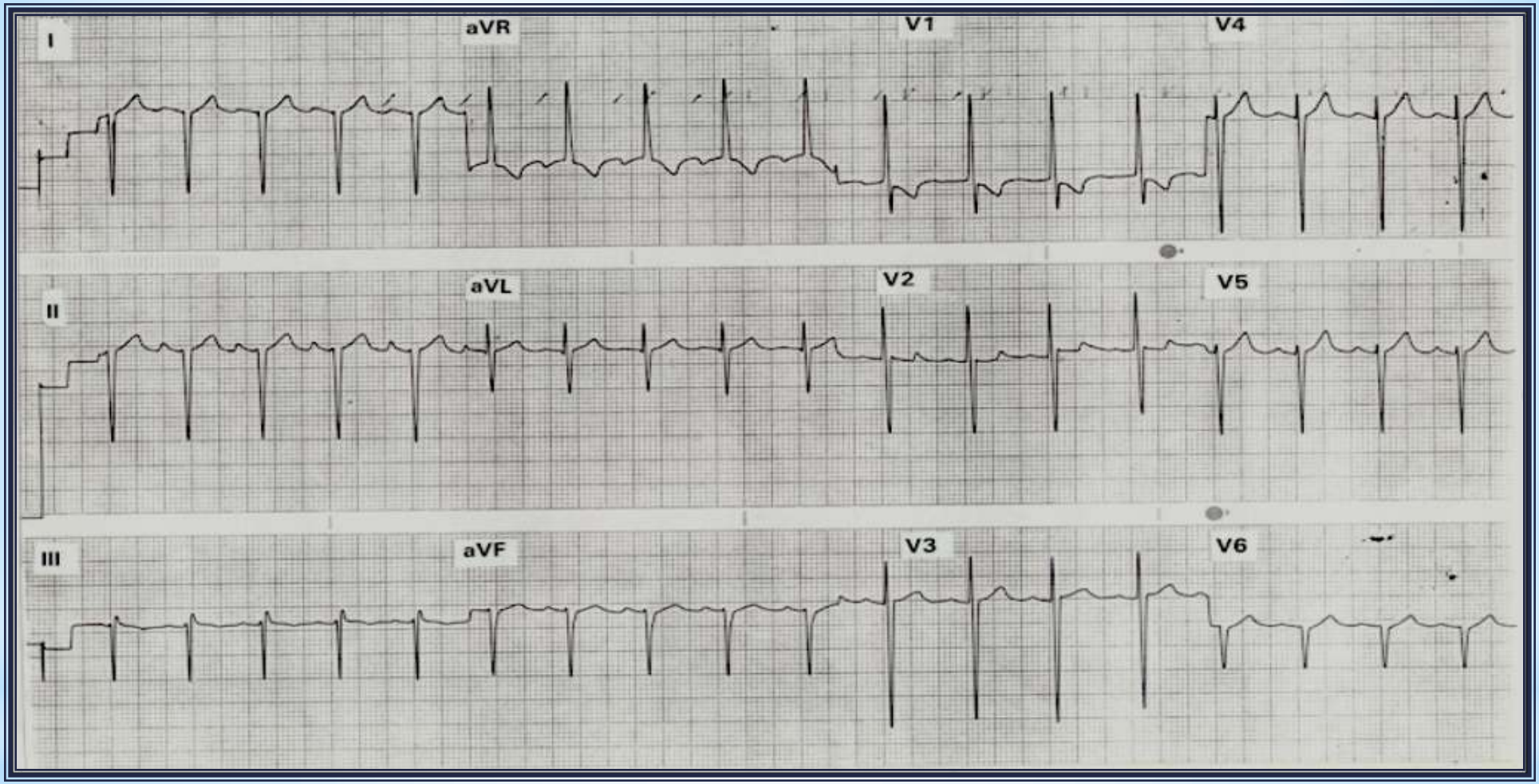
AXIS 3

2/15/2012



AXIS 4

2/15/2012

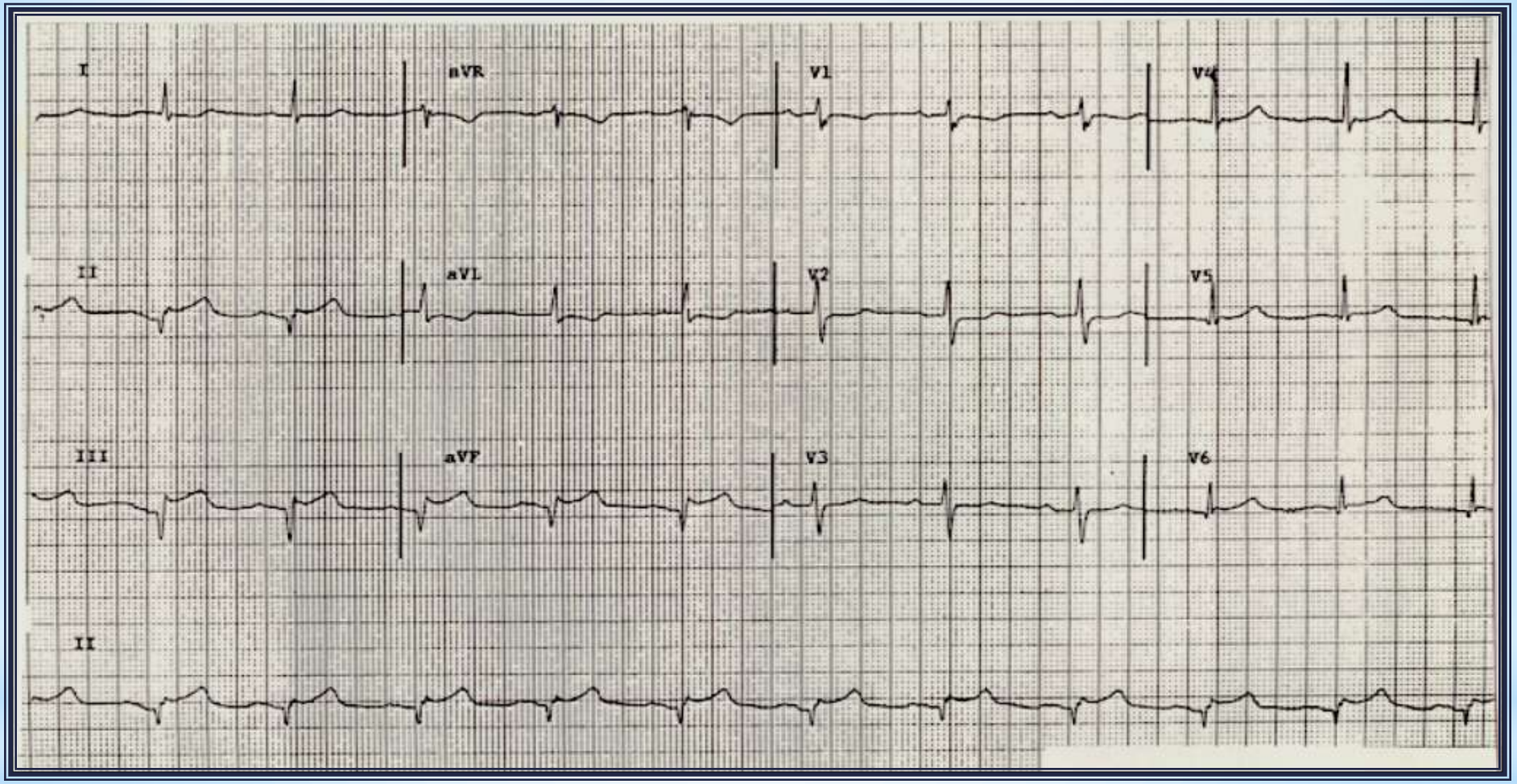


AXIS 5

2/15/2012

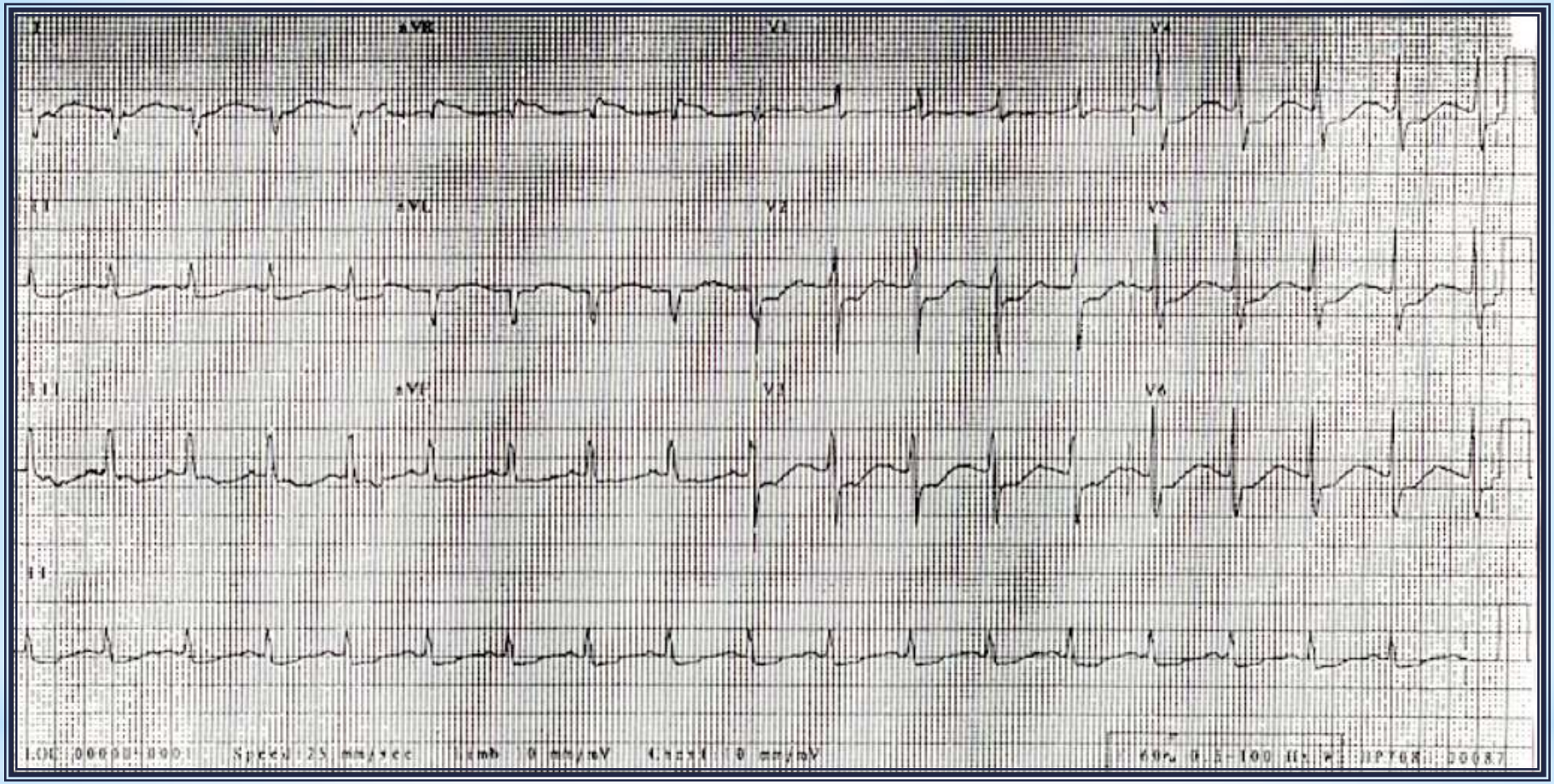
DEXTROCARDIA

2/15/2012



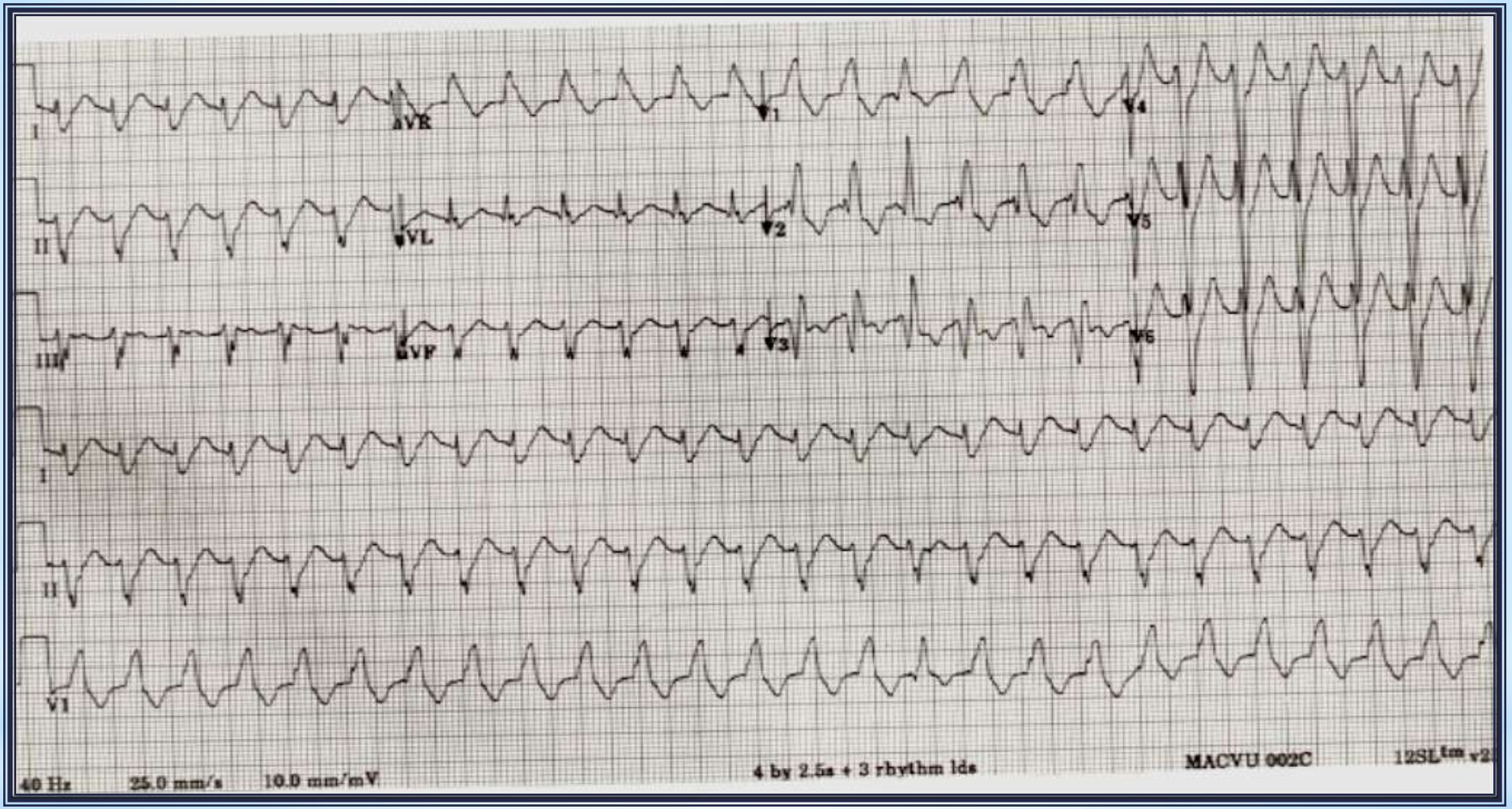
AXIS 6

2/15/2012



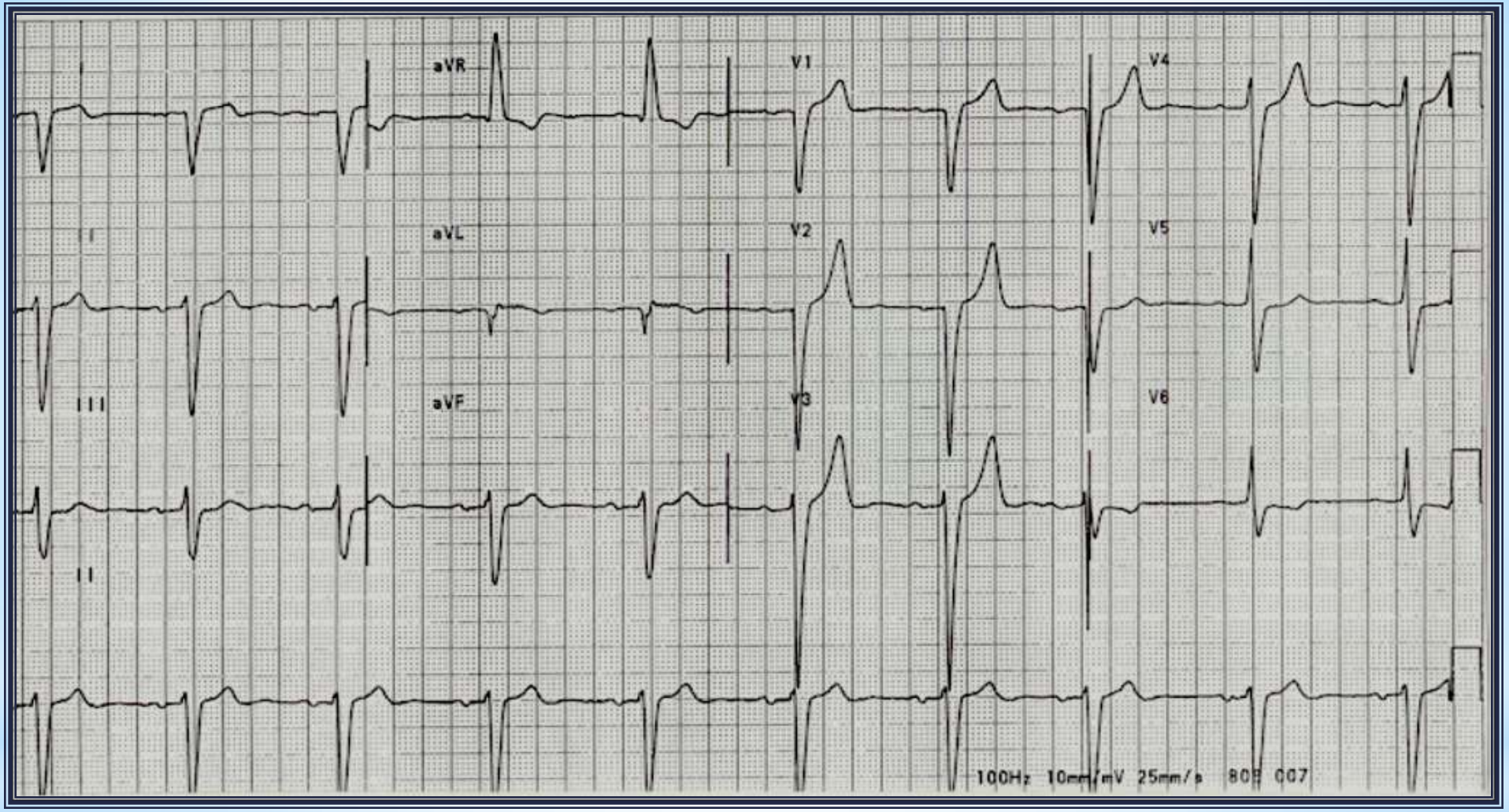
AXIS 7

2/15/2012



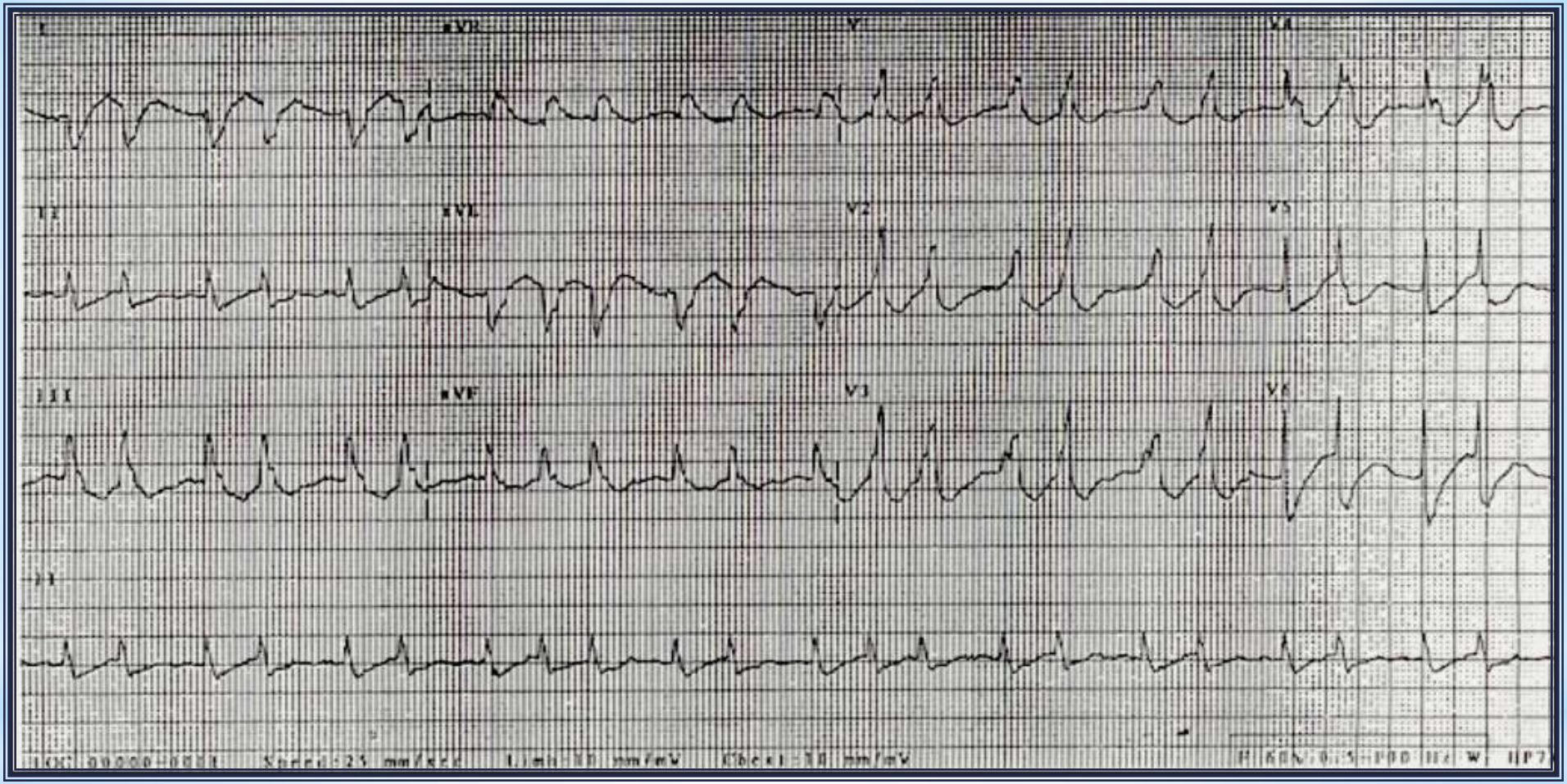
AXIS 8

2/15/2012



AXIS 9

2/15/2012



AXIS 10

2/15/2012

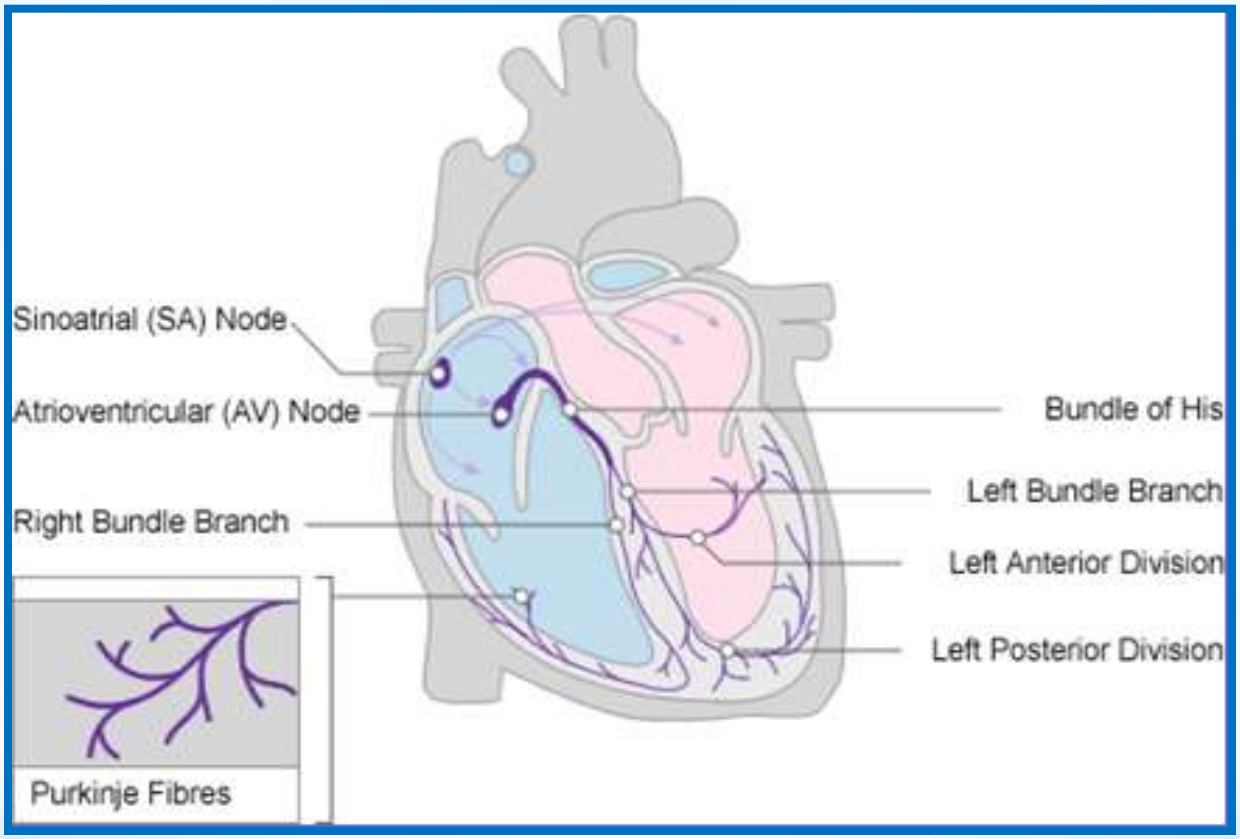
" IF ONE OF THE BRANCHES OF THE BUNDLE OF HIS IS BLOCKED, THE IMPULSE TRAVELS DOWN TO THE OTHER VENTRICLE FIRST. HAVING ACTIVATED THIS VENTICLE, THE IMPULSE SPREADS THROUGH THE SEPTUM TO THE OTHER VENTRICLE AND ACTIVATES THAT LAST"

* ***QRS***

LBBB .12 >

RBBB .11 >

BUNDLE BRANCH BLOCKS



BUNDLE BRANCH BLOCKS

Ischemic Heart Disease

STEMI

HTN

Cardiomyopathy

Aortic Stenosis

Acute Heart Failure

Hyperkalemia

Tumors

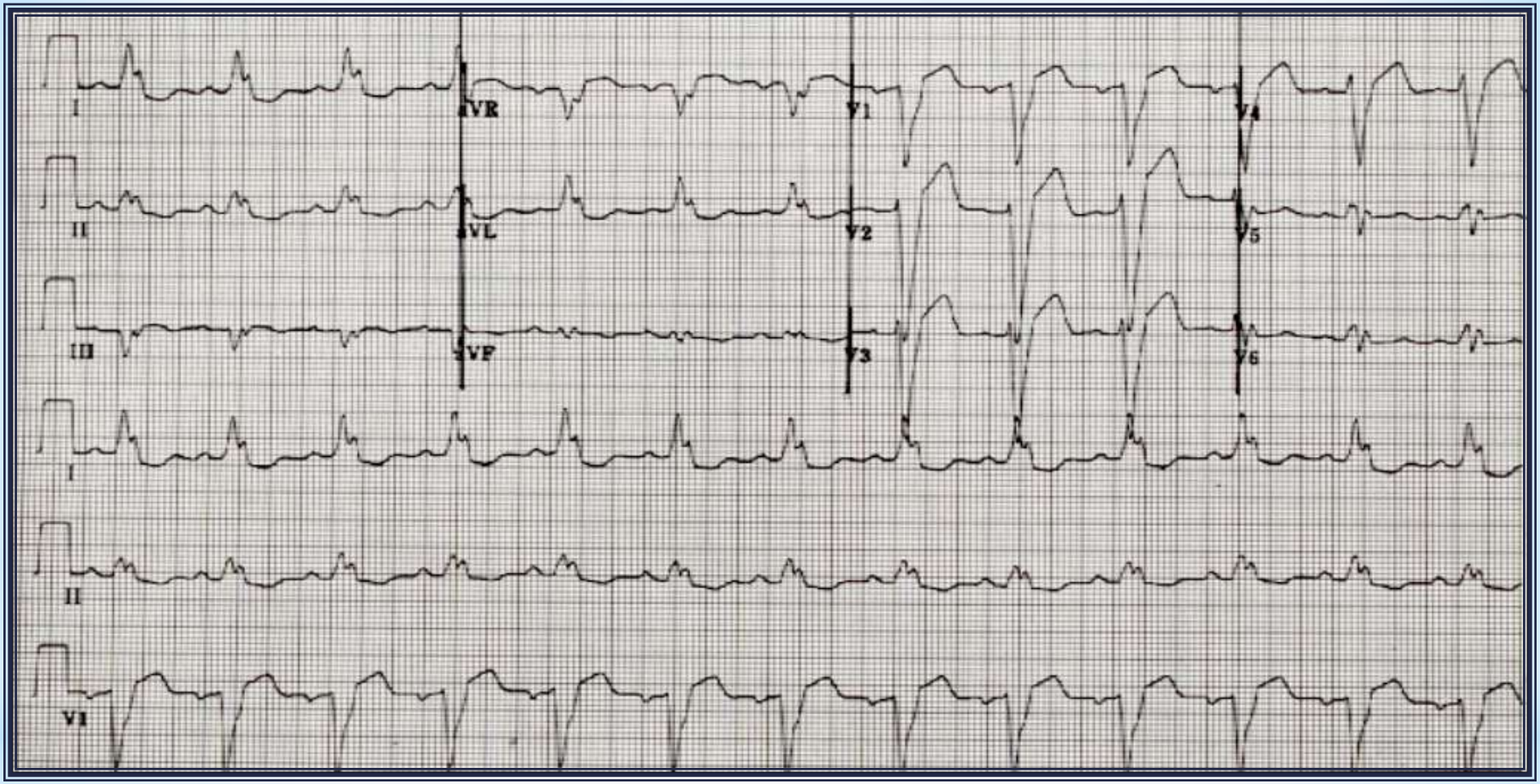
Trauma

Syphilis

Acute Infections

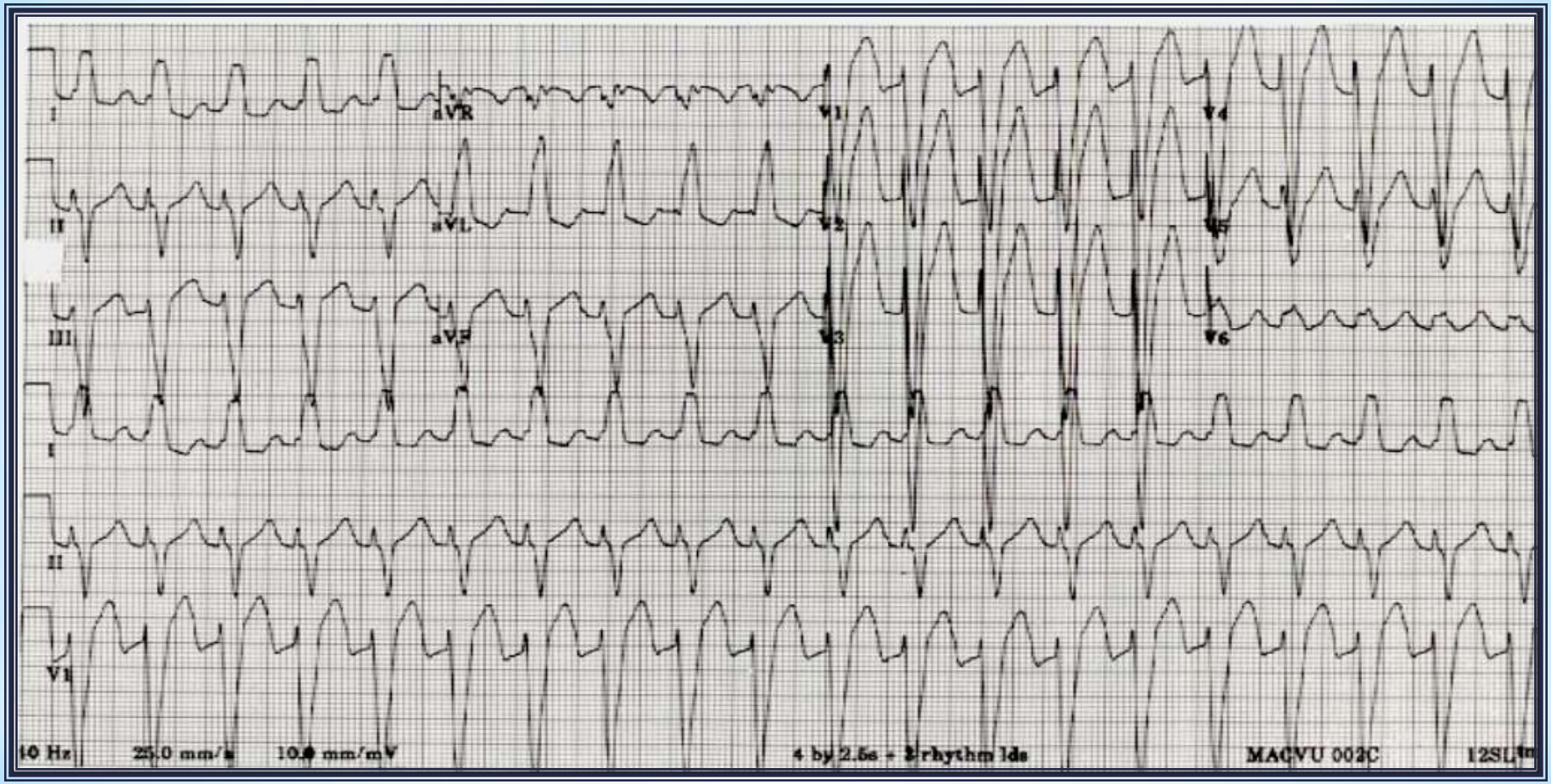
Exotic Diseases

CAUSES OF BBB



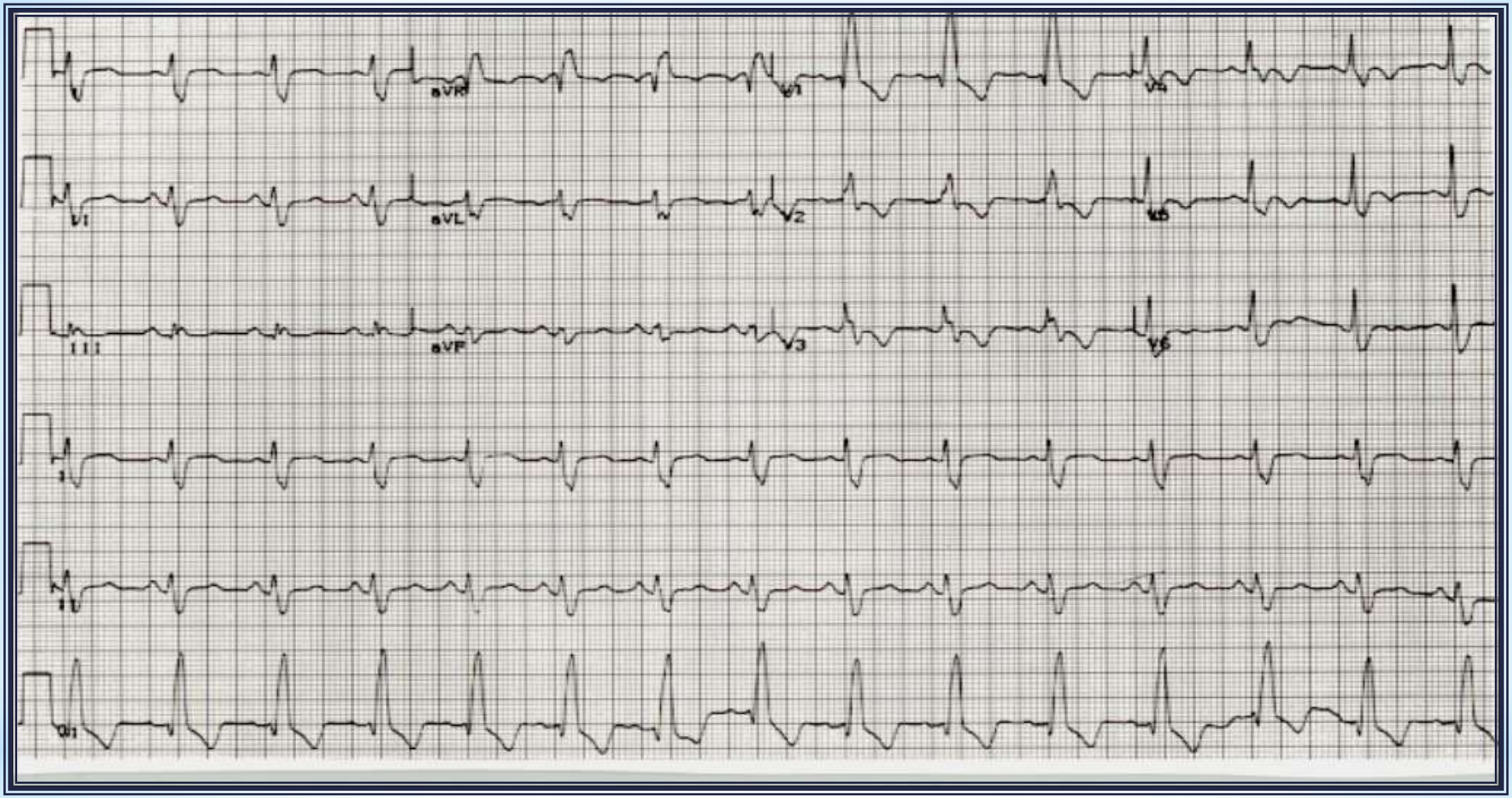
LBBB # 1

2/15/2012



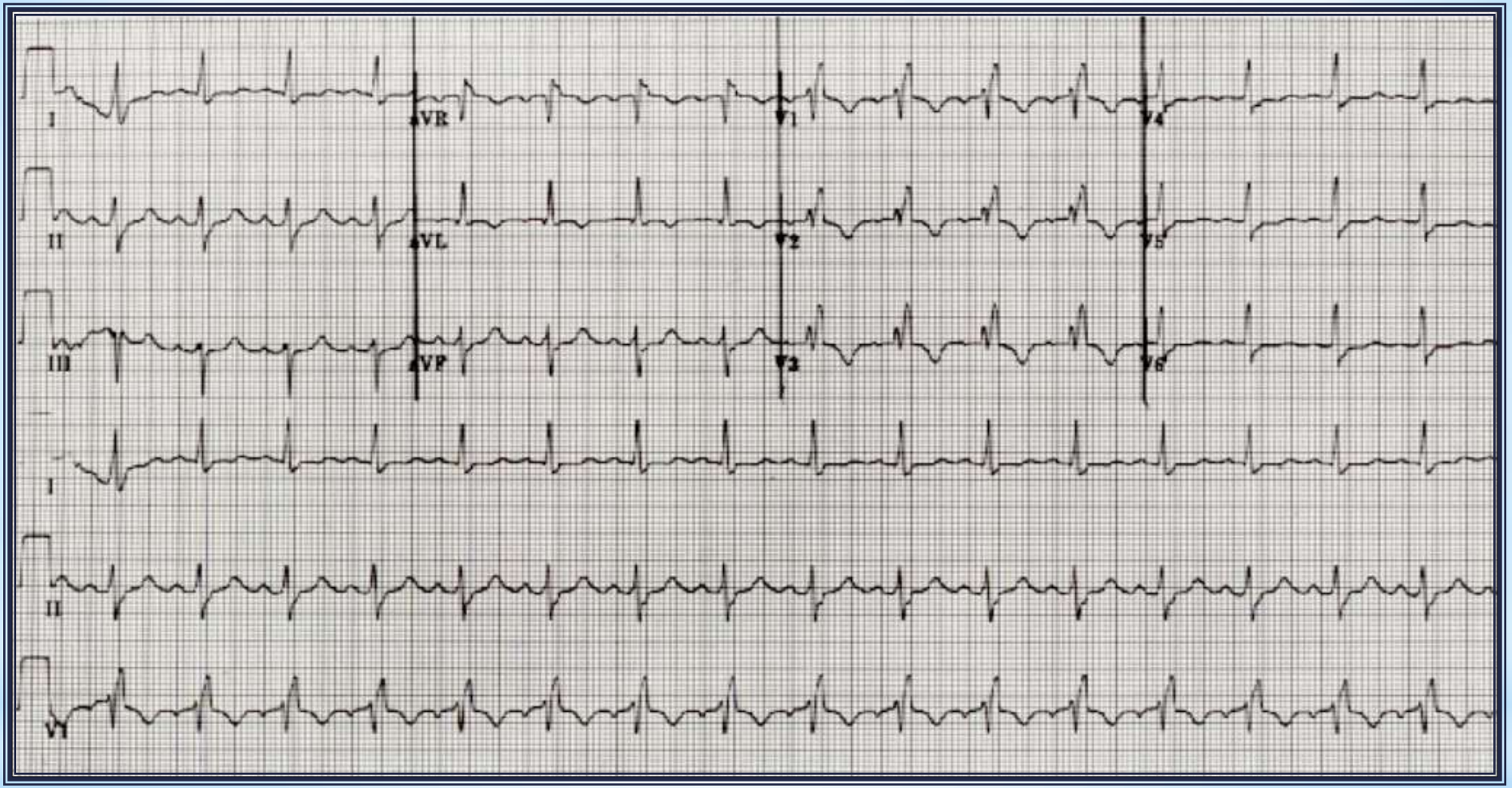
LBBB # 2

2/15/2012



RBBB # 1

2/15/2012



RBBB # 2

2/15/2012

- *ABNORMALITY IN THE ANTERIOR OR POSTERIOR DIVISION OF THE LEFT BUNDLE BRANCHES*
- *ANTERIOR DIVISION IS LONGER, THINNER & LIES ANTERIOR (Single Blood Supply)*
- *POSTERIOR DIVISION IS SHOTER, THICKER & LIES POSTEIOR (Double Blood Supply)*

HEMIBLOCKS

* Right Bundle Branch Block

  W/

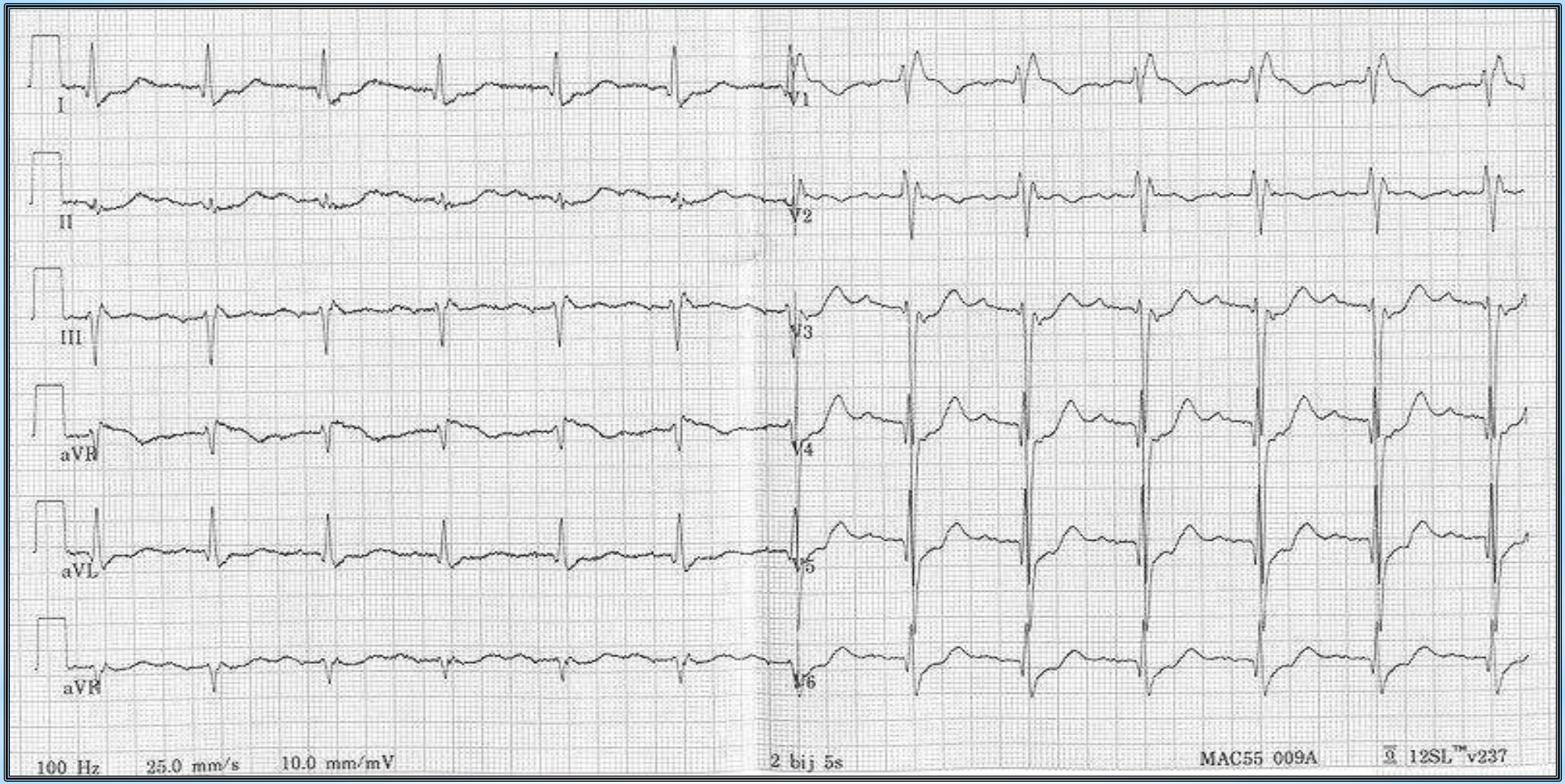
    LAH or LPH

* Suspect w/

  RBBB w/LAD = Bifasicular Block Anterior

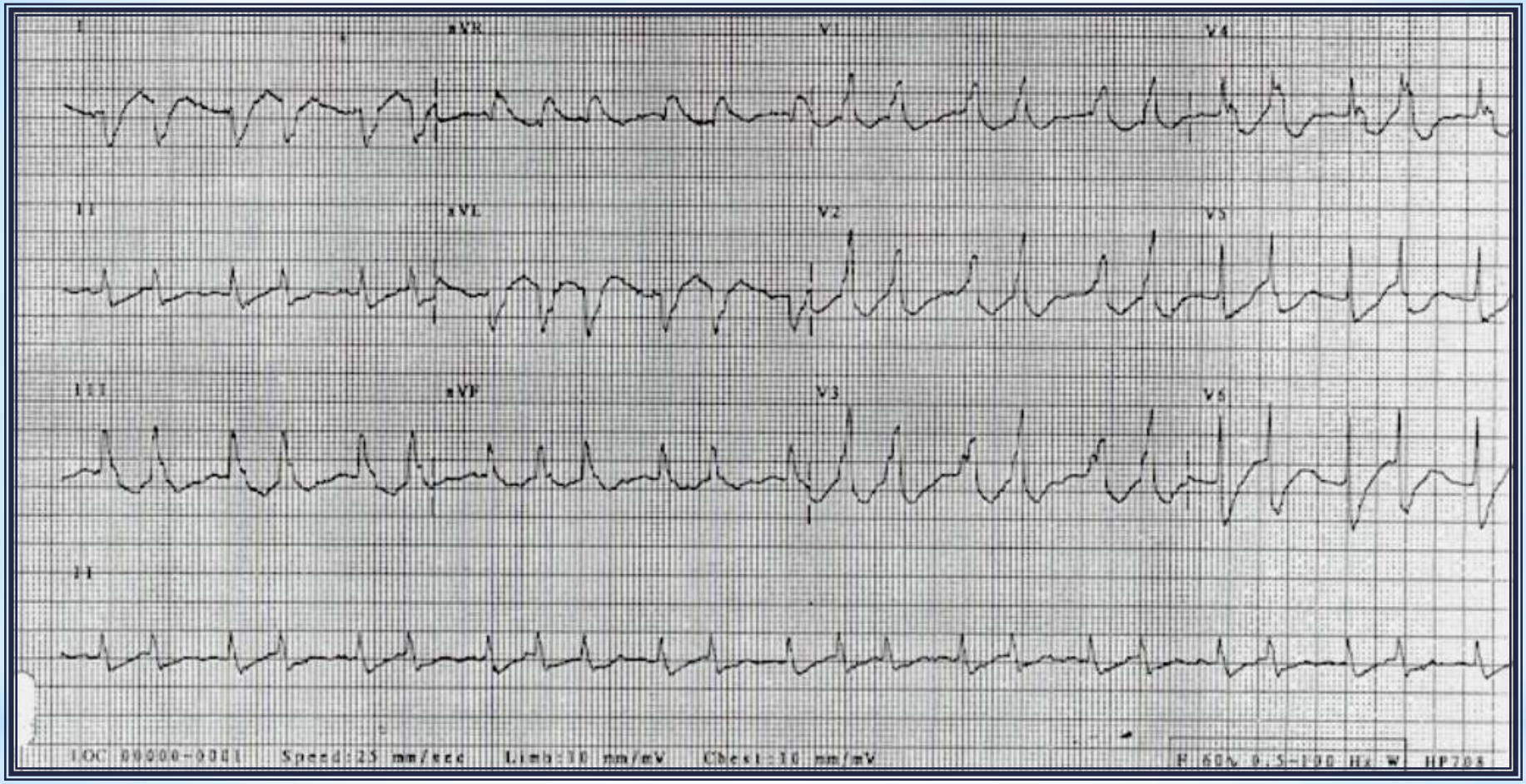
  RBBB w/RAD = Bifasicular Block Posterior

BI-FASCICULAR BLOCK



BI-FASICULAR ANTERIOR

2/15/2012



BI-FASICULAR POSTERIOR

2/15/2012

- 1ST Degree AV Block with BBB
- All Types of Second Degree AV Block
- Bifasicular Blocks
  - Posterior
- Medications to Use With Caution:
  - **ANTI ARRYTHMICS**
  - ***ATROPINE***
  - ***MORPHINE***

PRE CURSERS TO COMPLETE HEART BLOCK

Pre Excitation Syndrome

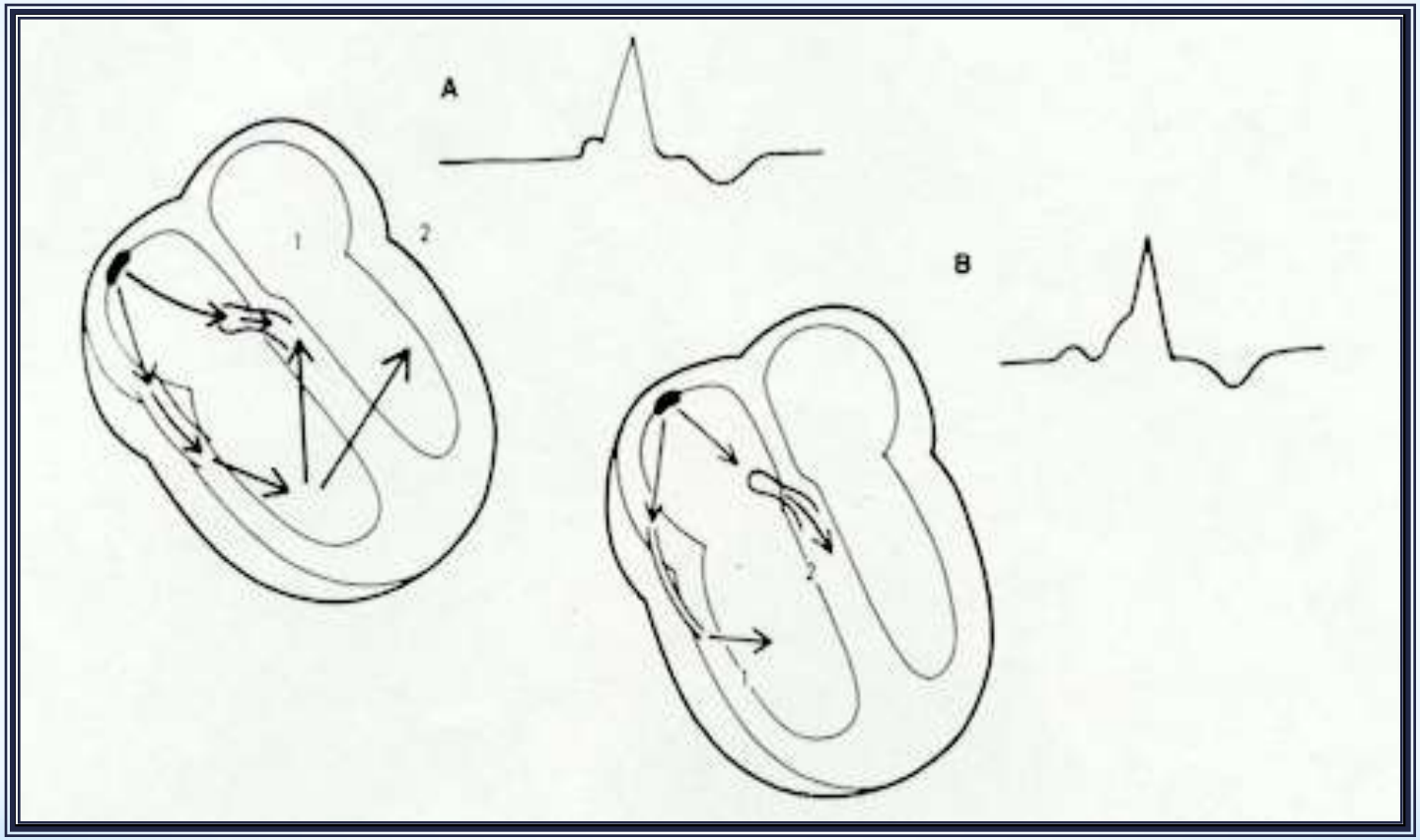
Uses Accessory Pathways

SVT and Hypotension

* Short P-R Interval
* Widened QRS / ***Delta Wave***
* ST-T Changes

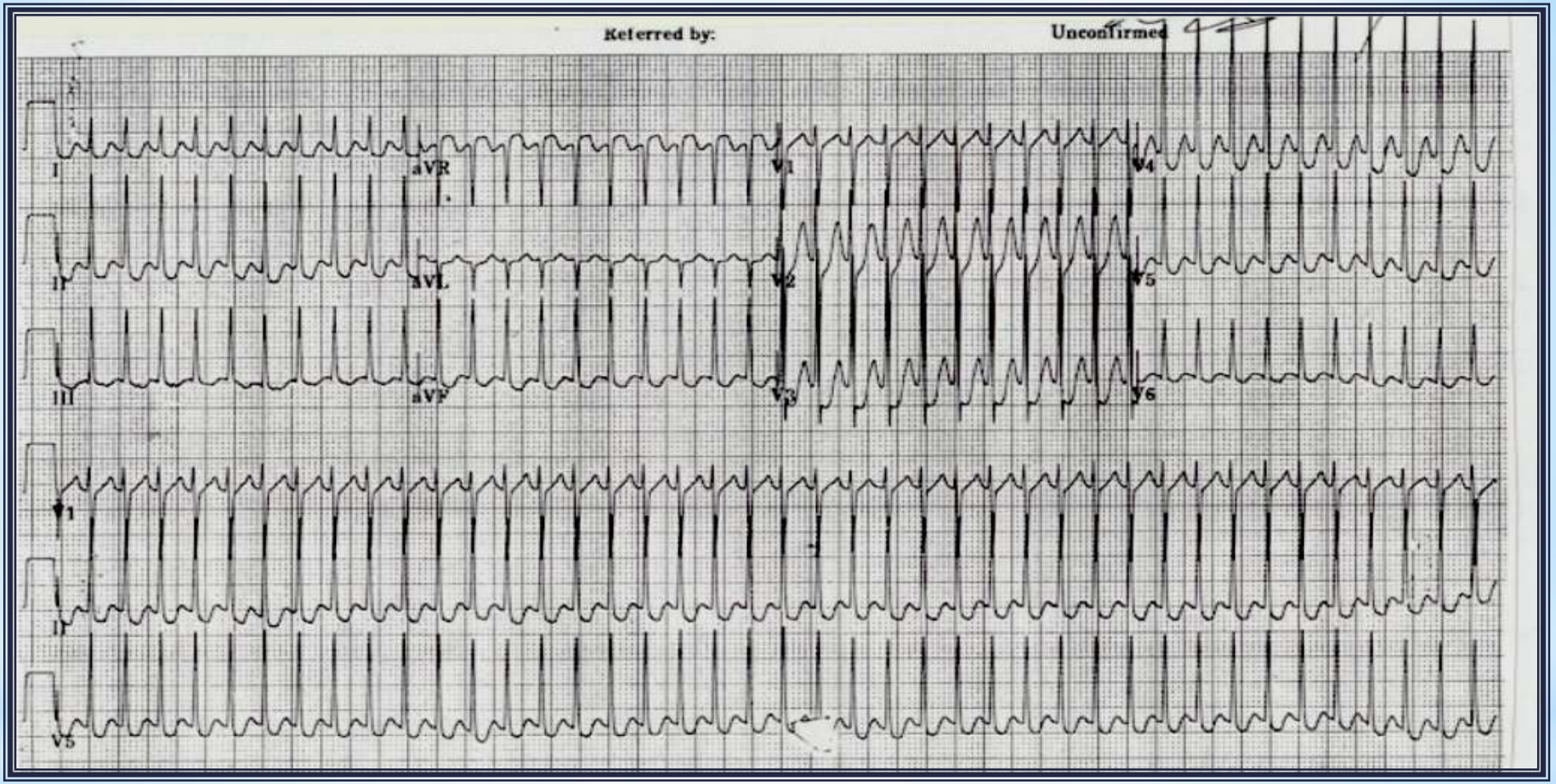
WPW SYNDROME

2/15/2012



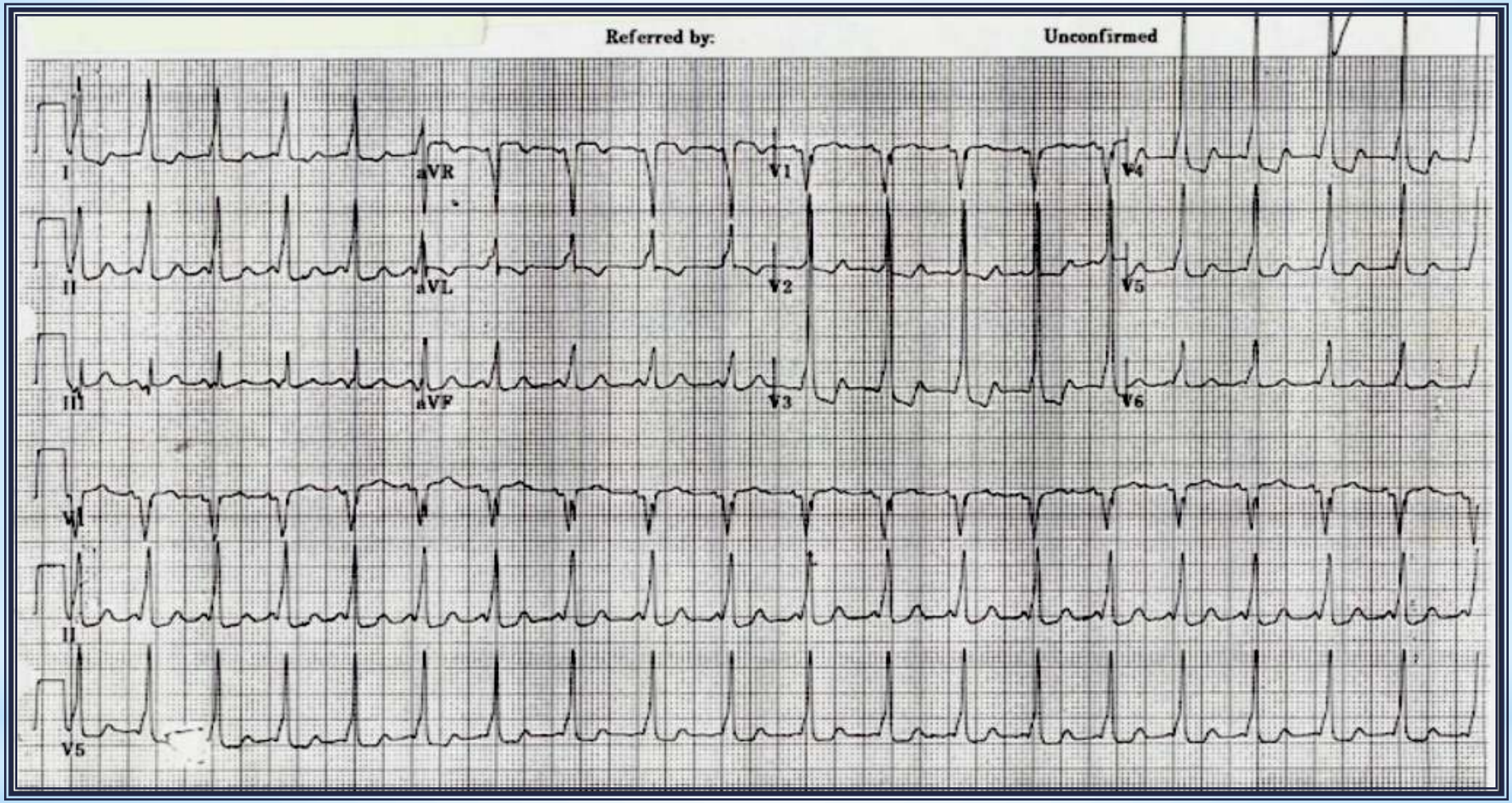
WPW PATHWAYS

2/15/2012



WPW SYNDROME

2/15/2012

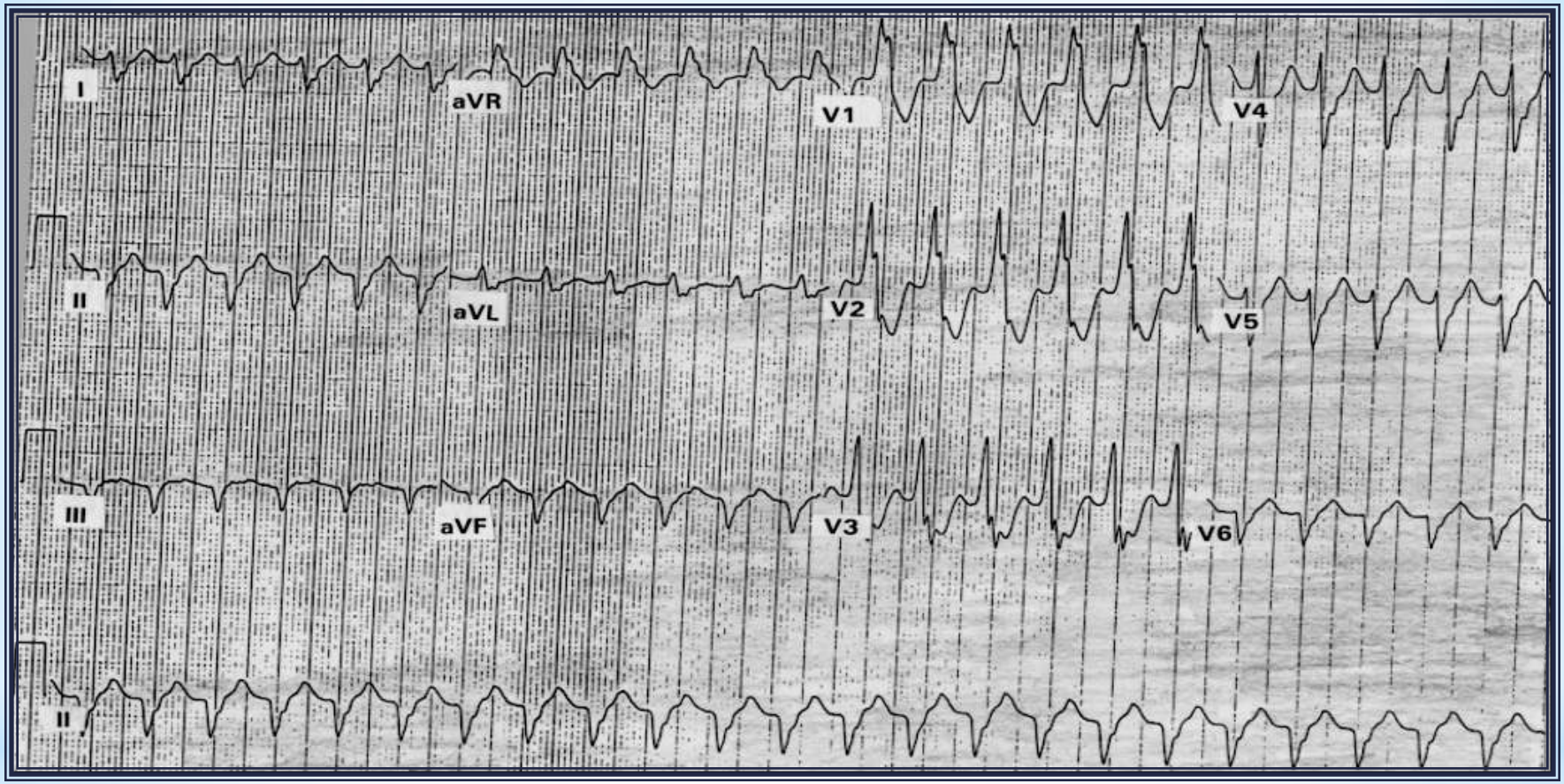


WPW SYNDROME

2/15/2012

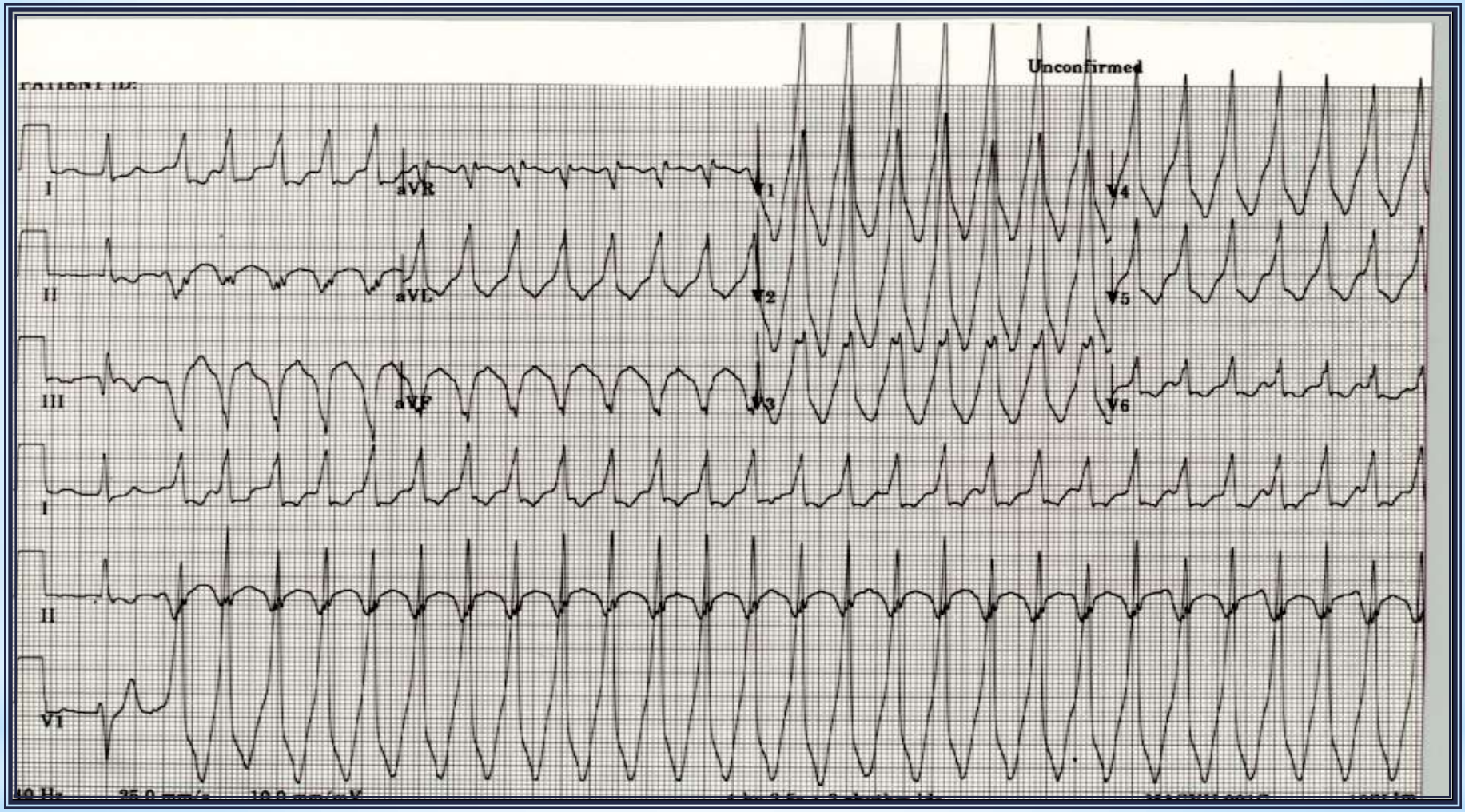
* > .14 Seconds
* V1 Clues
* Concordance in V Leads
* Extreme Right Axis
* HX of AMI

WHY V - TACH ?



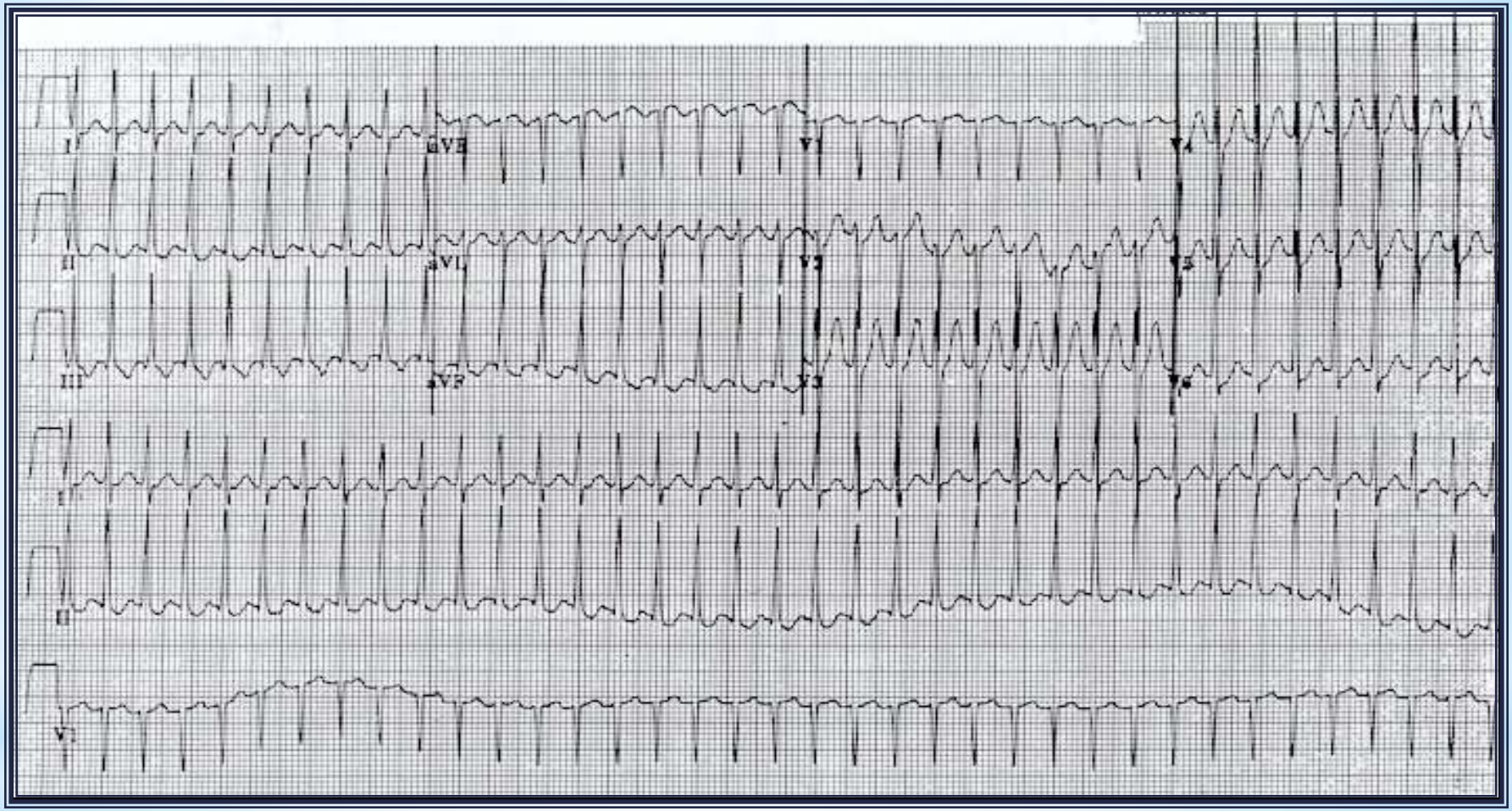
V-TACH - 1

2/15/2012



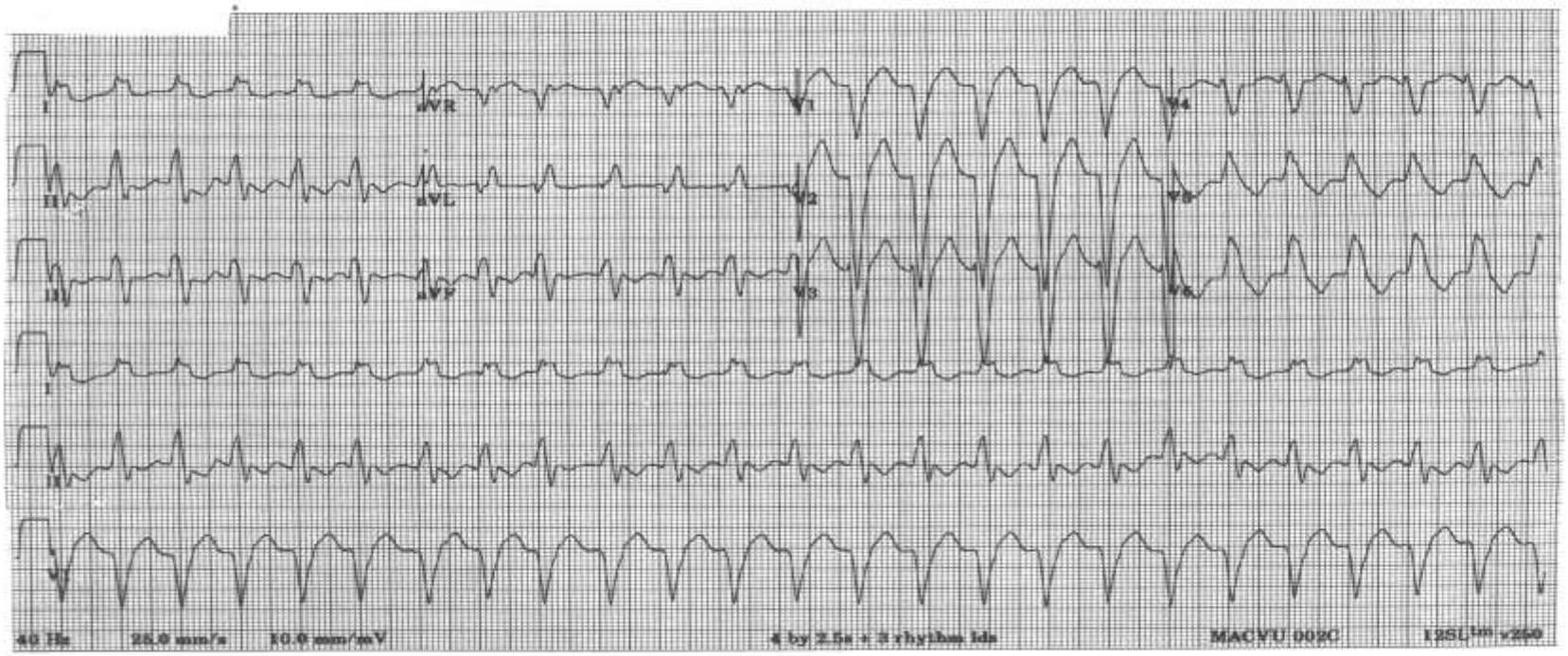
V-TACH - 2

2/15/2012



SVT

2/15/2012



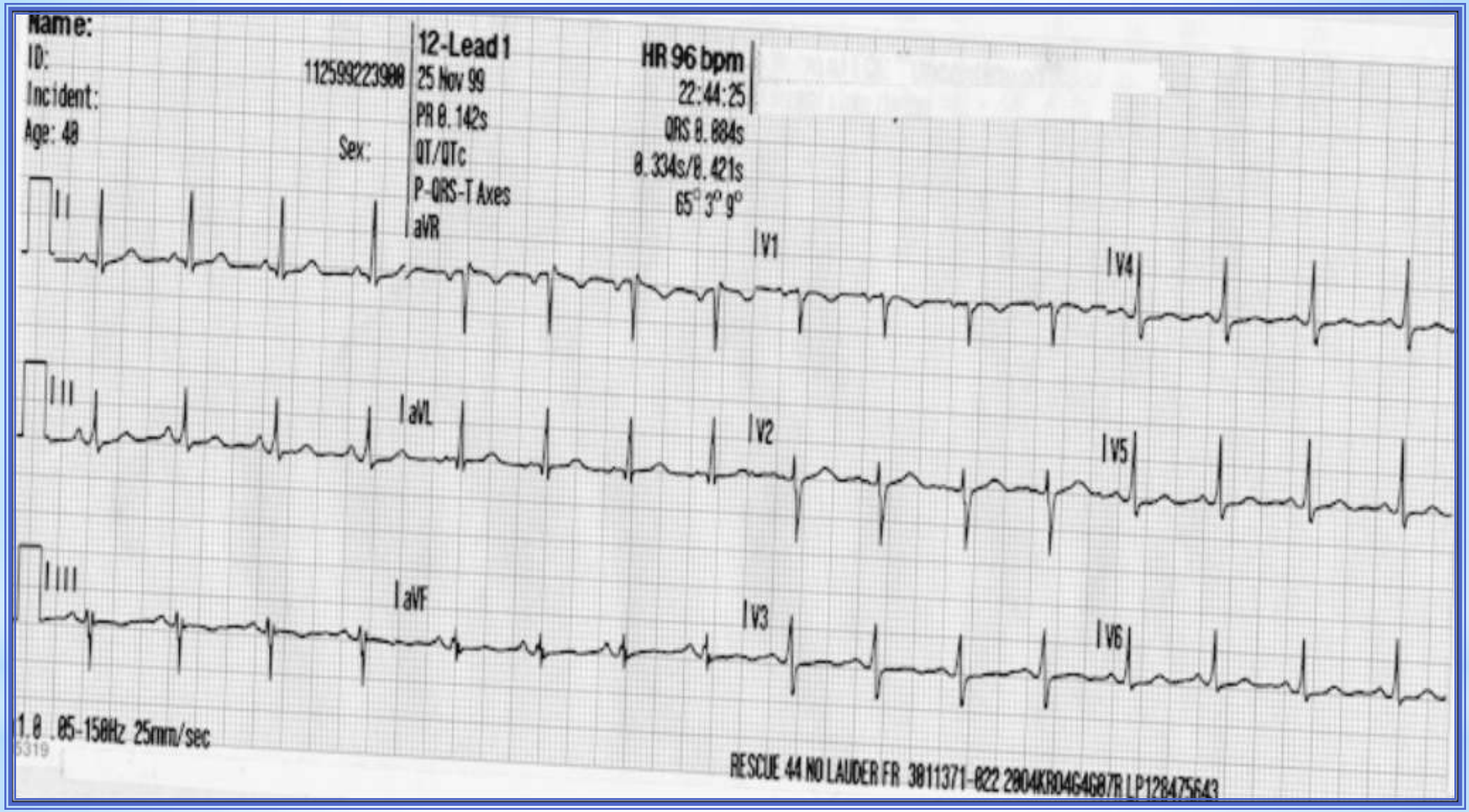
WIDE TACH ?

2/15/2012

ADVANCED ECG Workshops

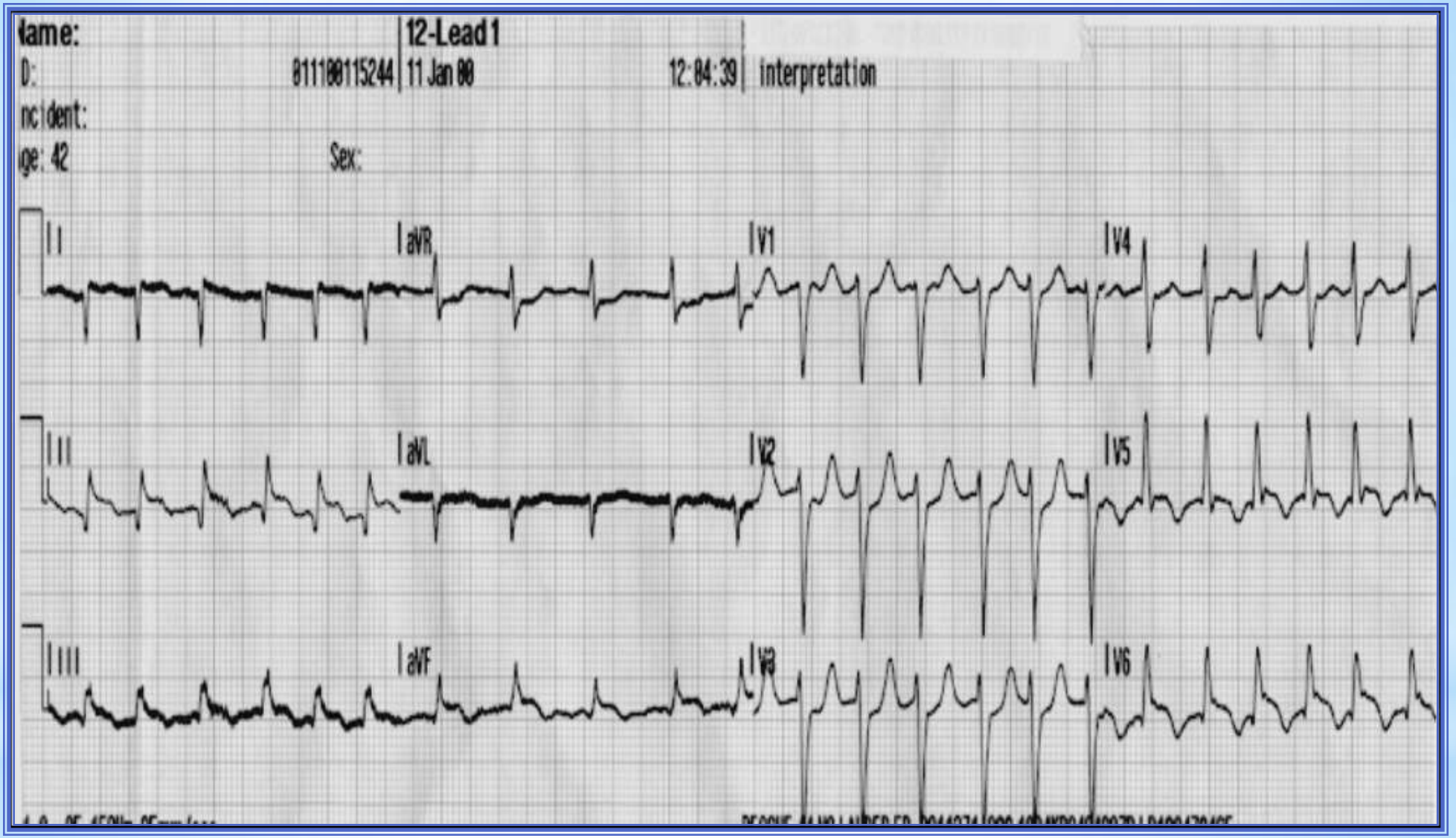
2/15/2012

WORKSHOP 1



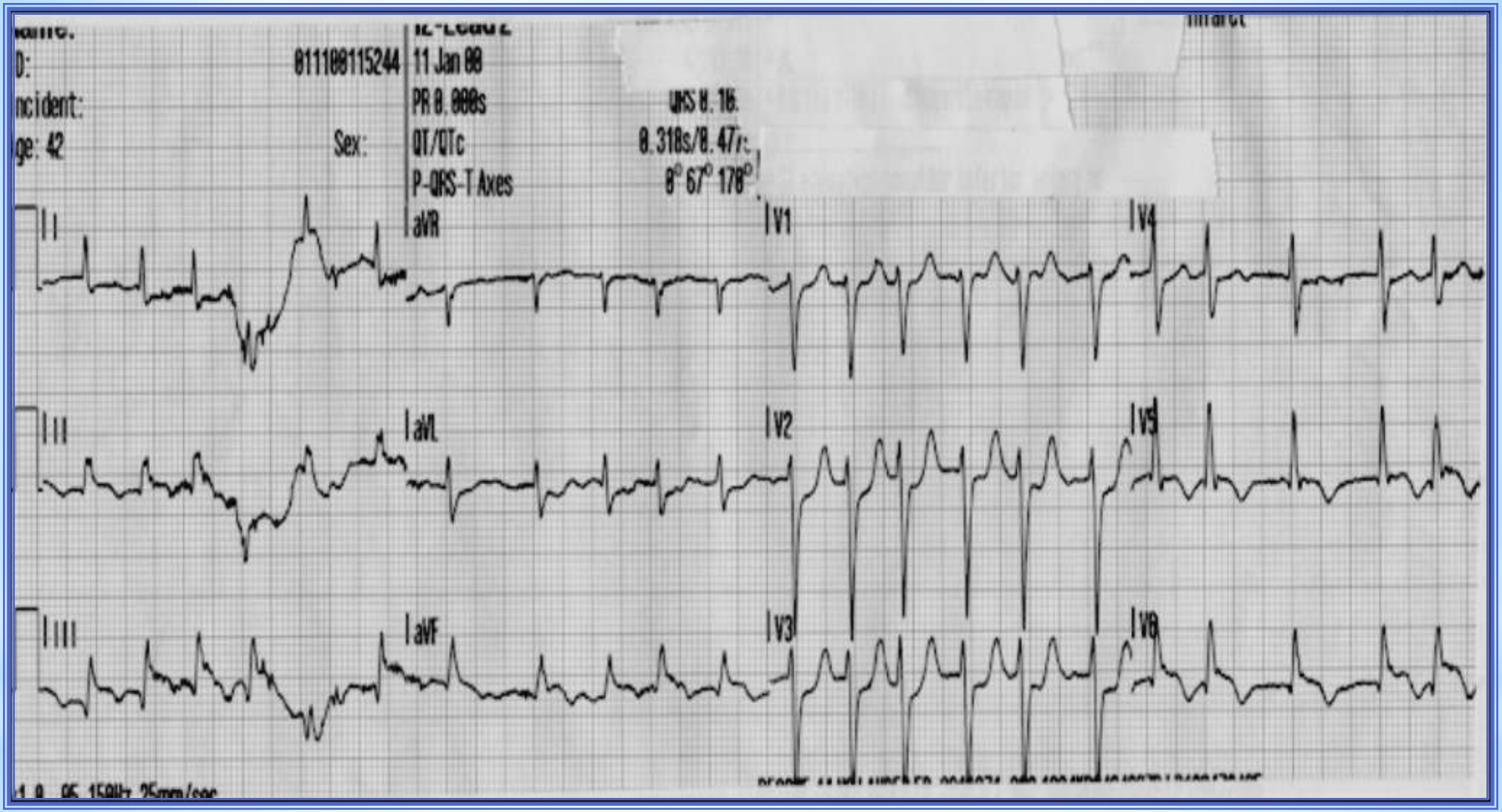
*Ecg 1

2/15/2012



*ECG 2

2/15/2012



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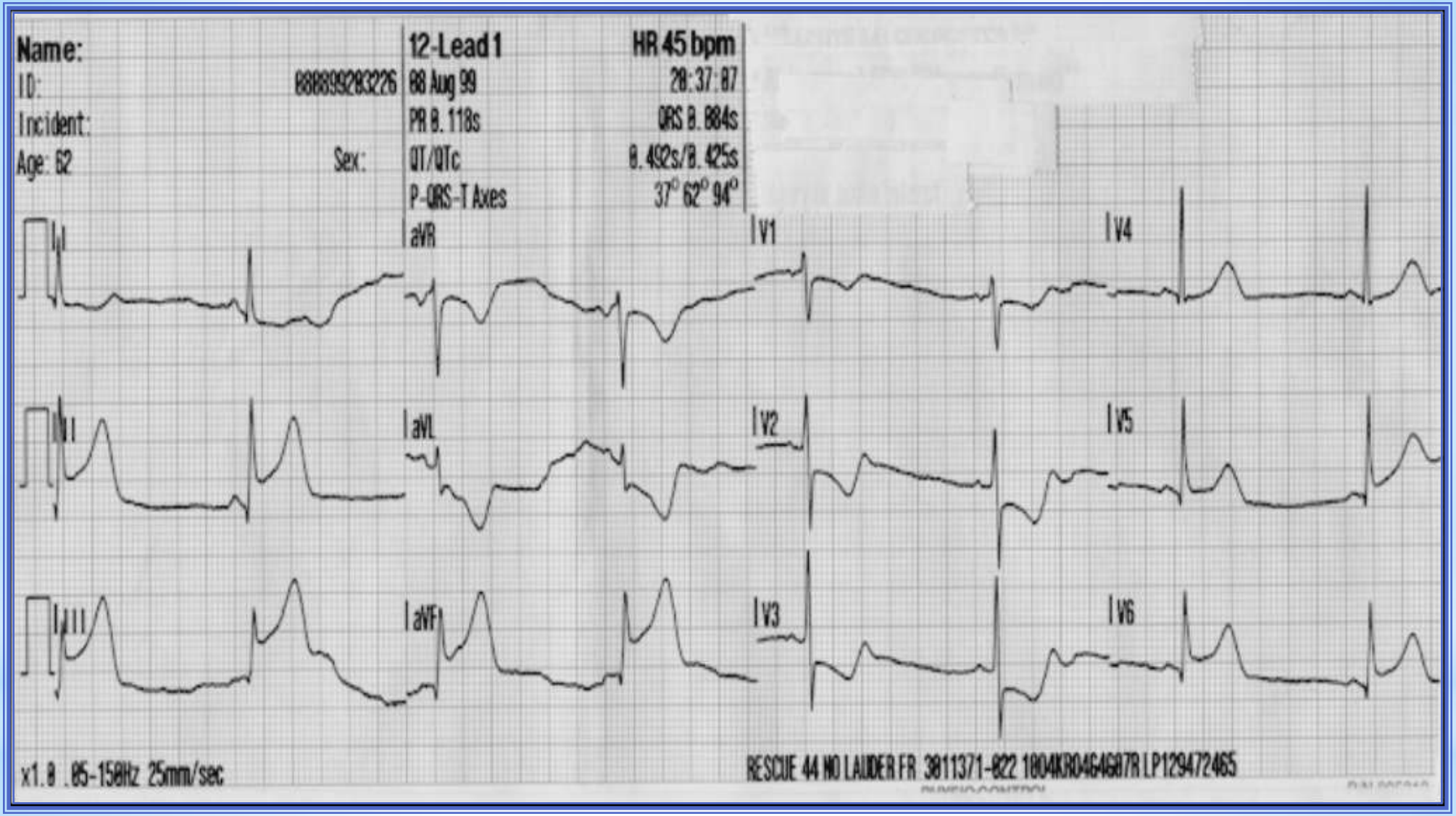
2/15/2012



*ECG 4

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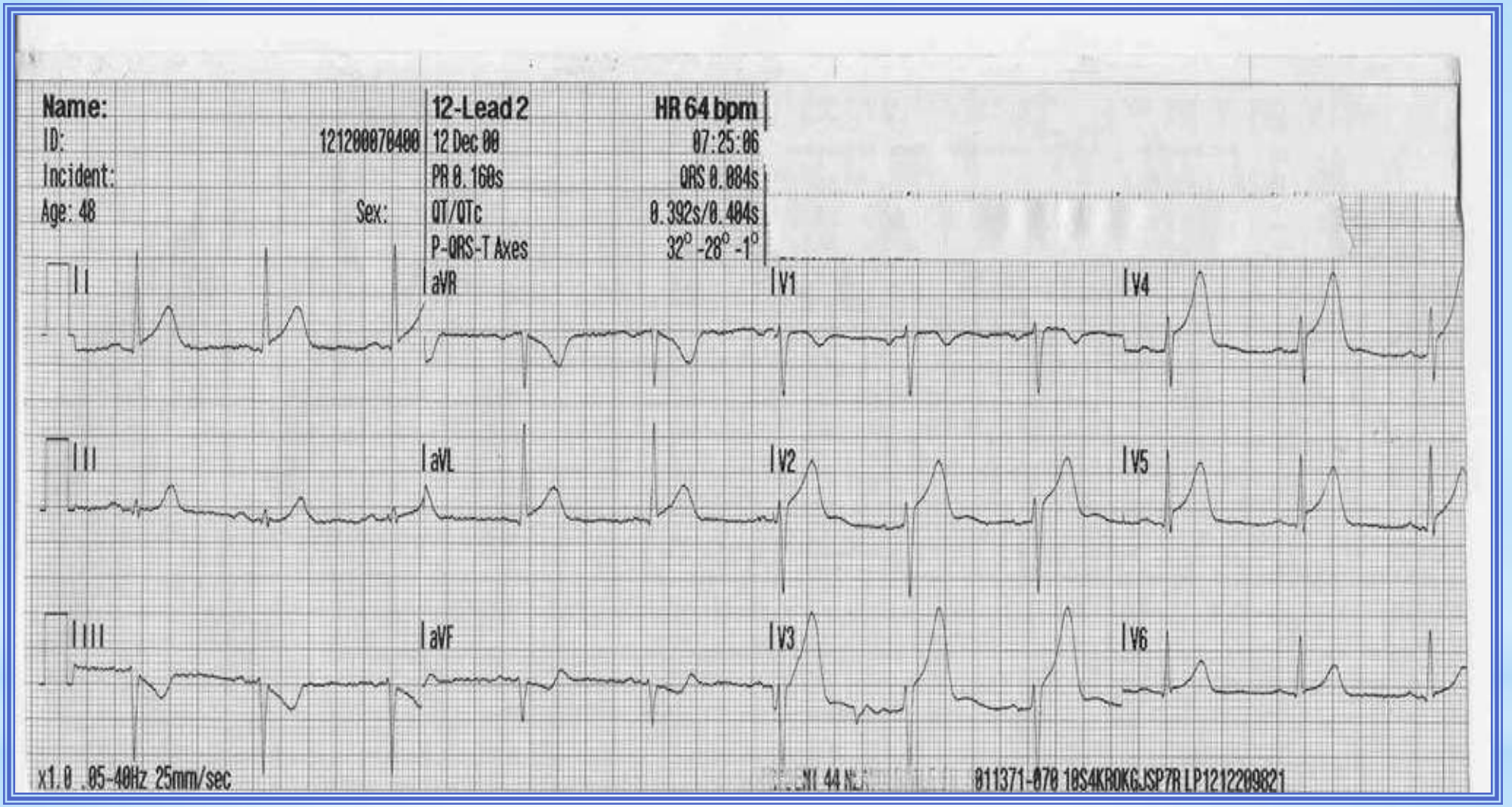

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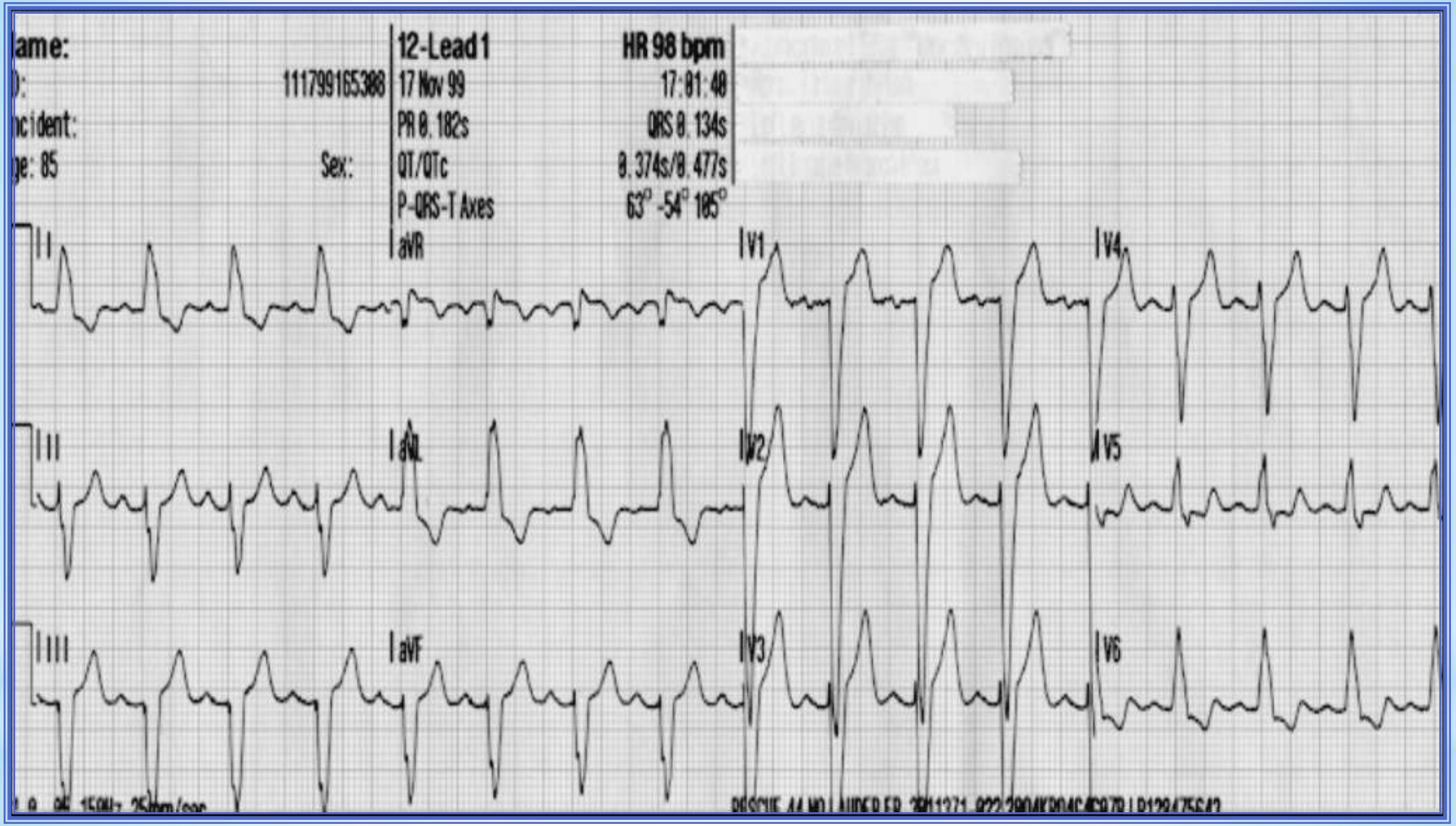

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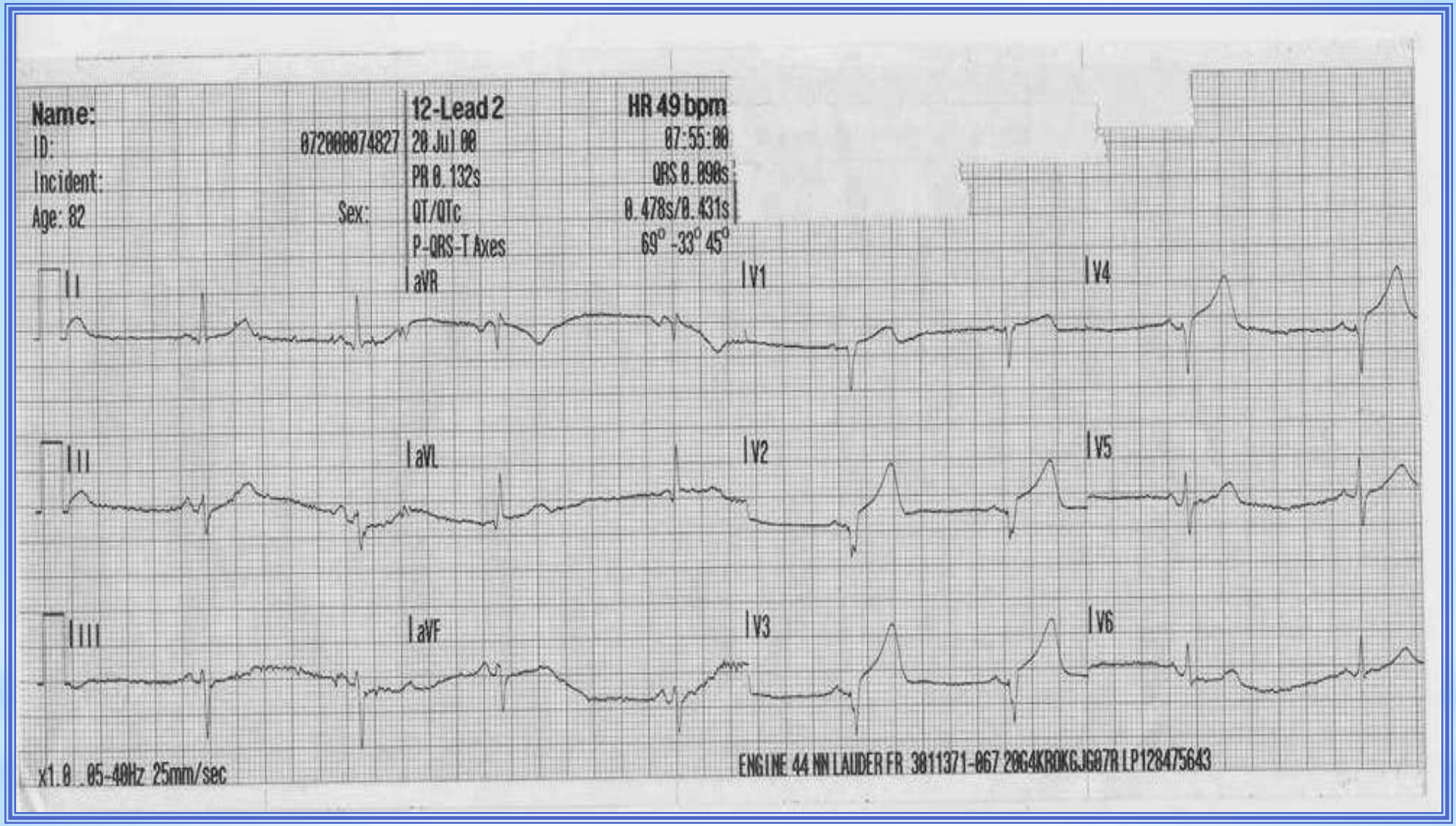
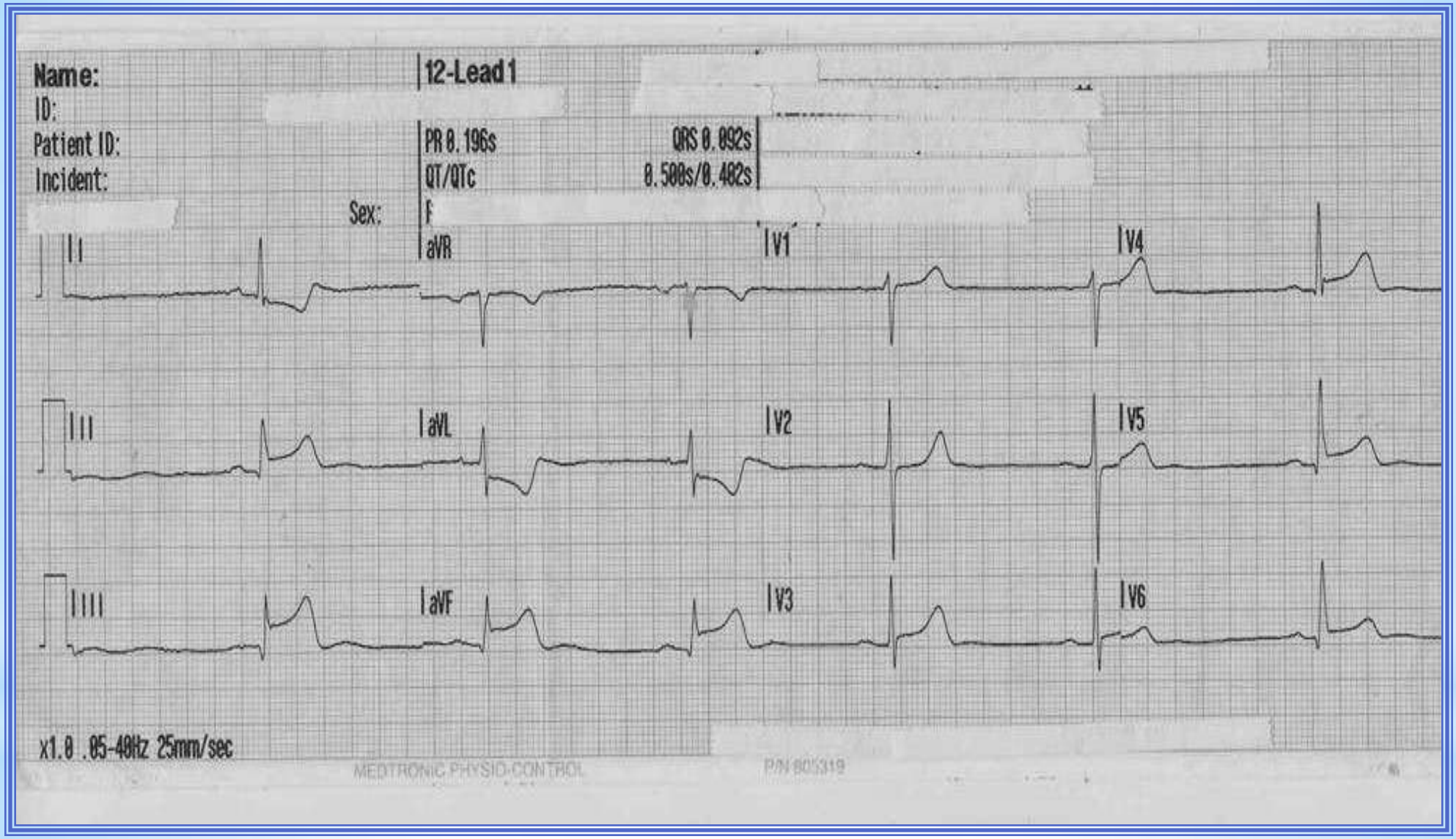


*ECG 7

2/15/2012



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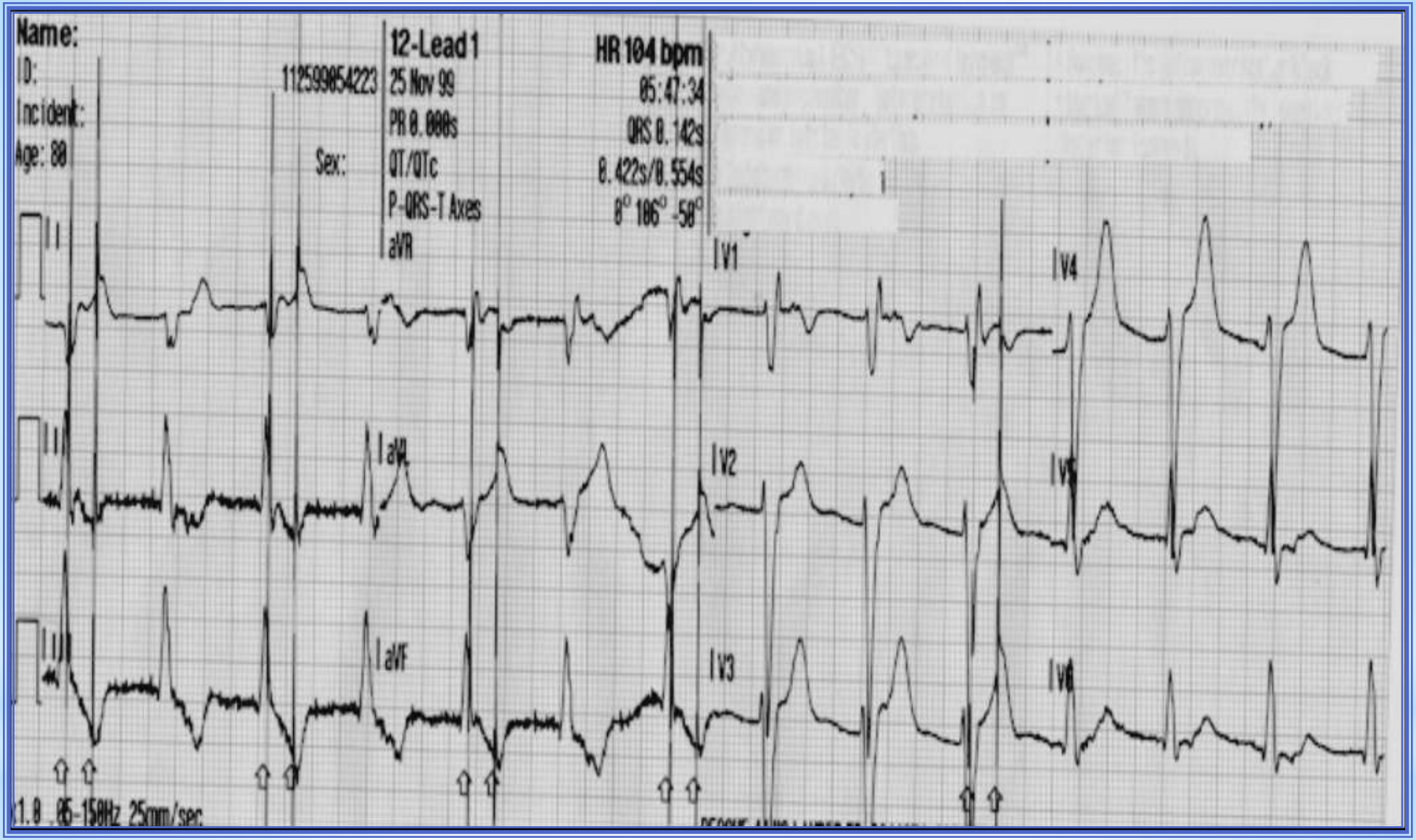
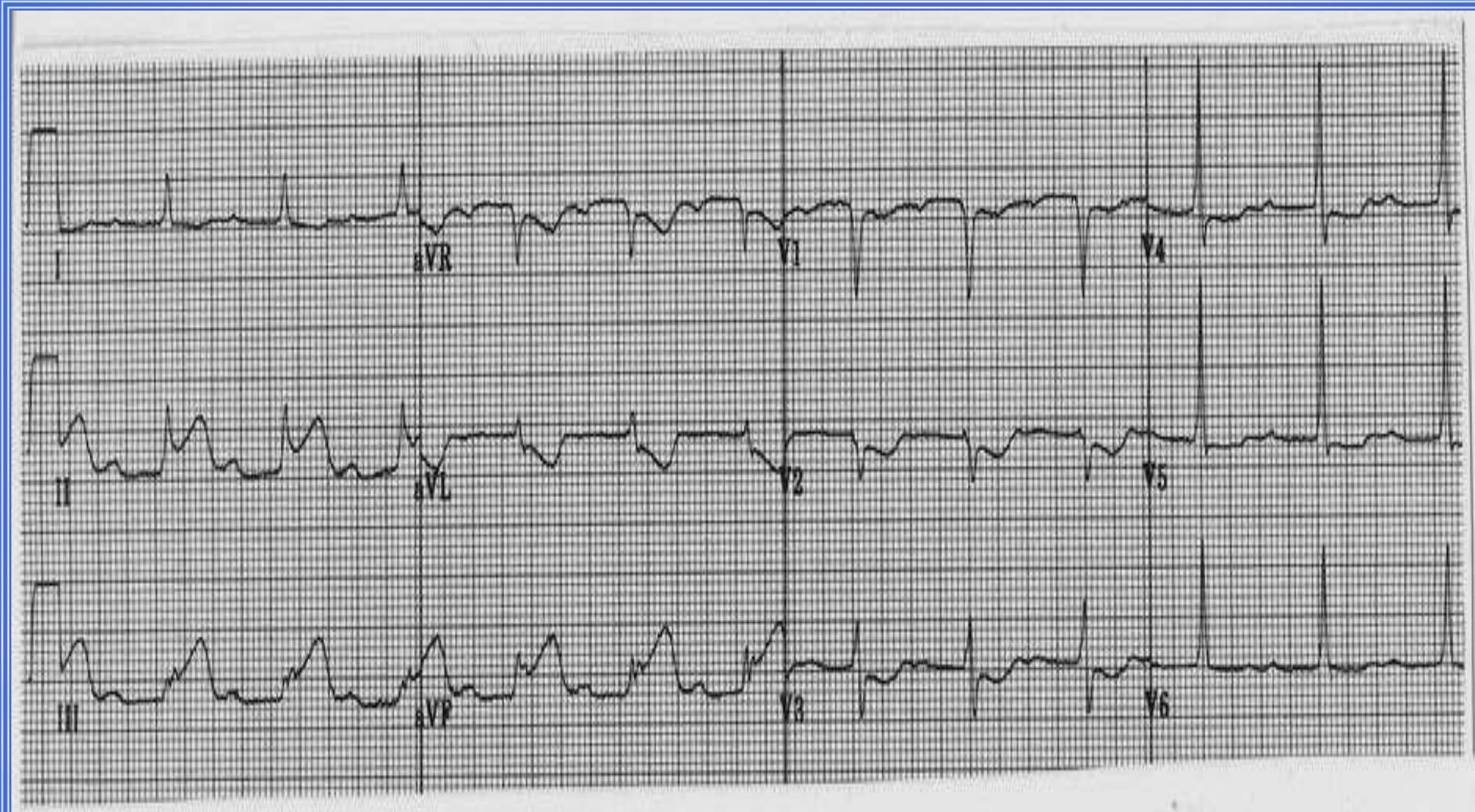


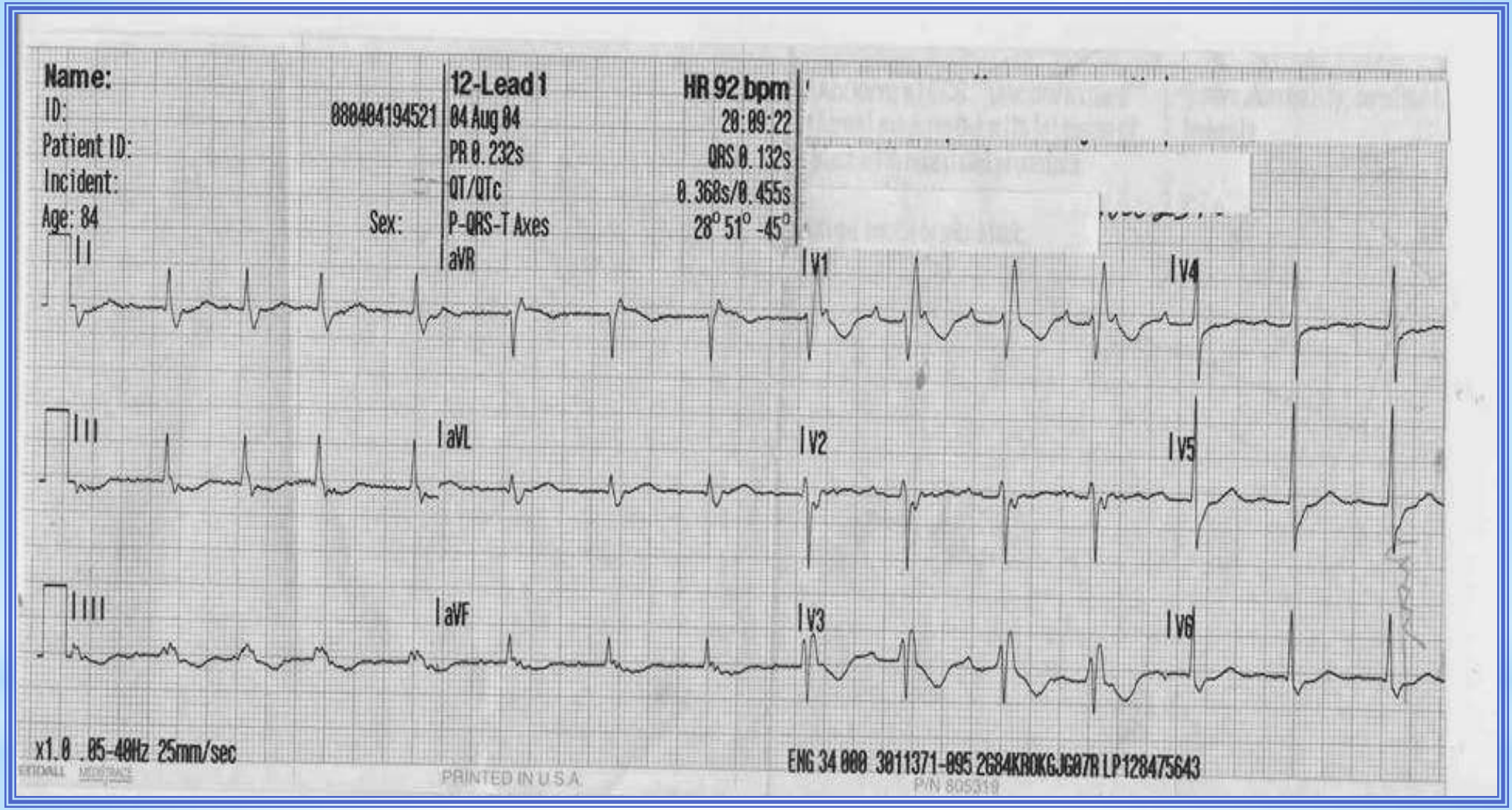
*ECG 9

2/15/2012



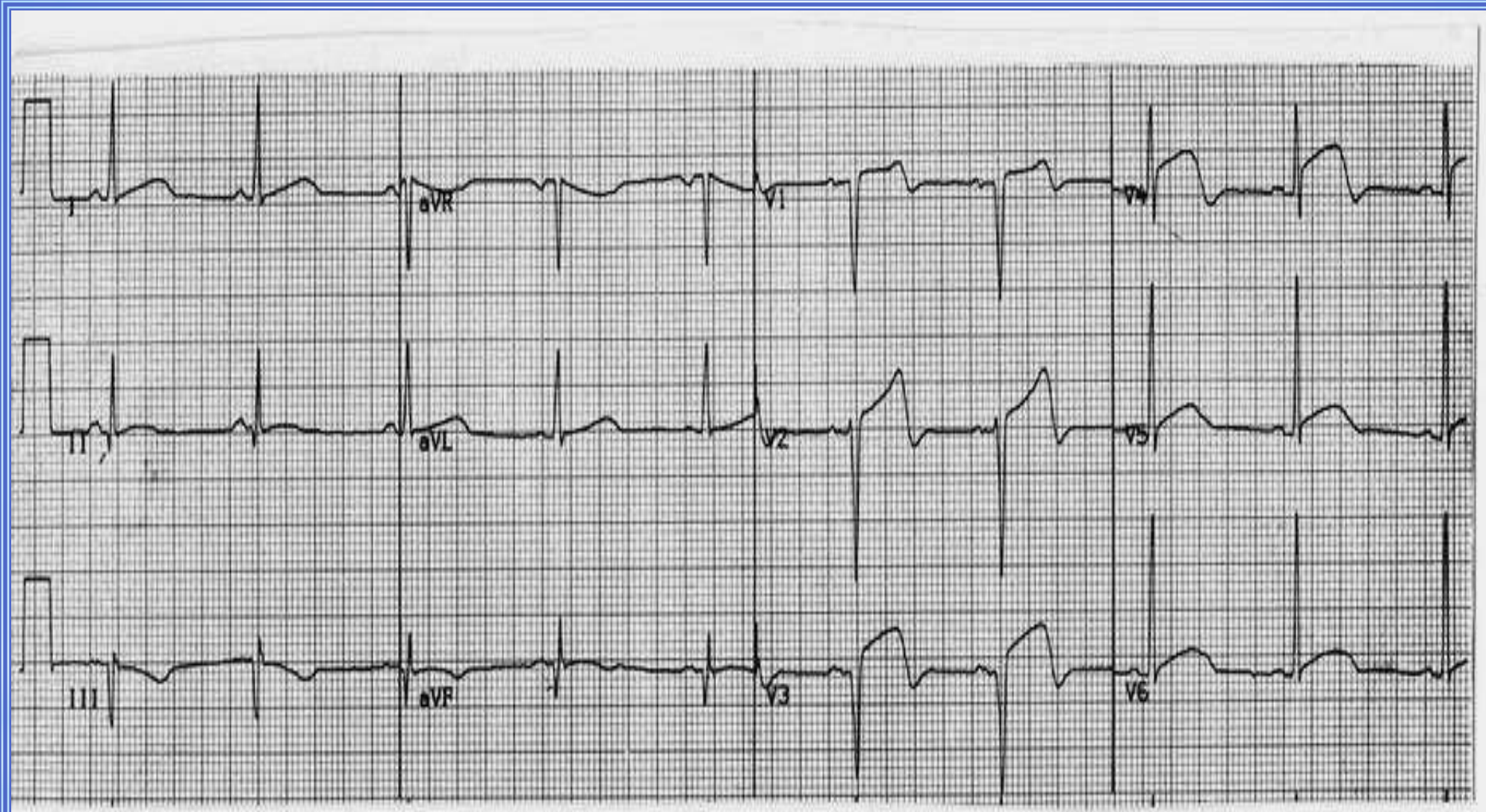
*ECG 10

2/15/2012



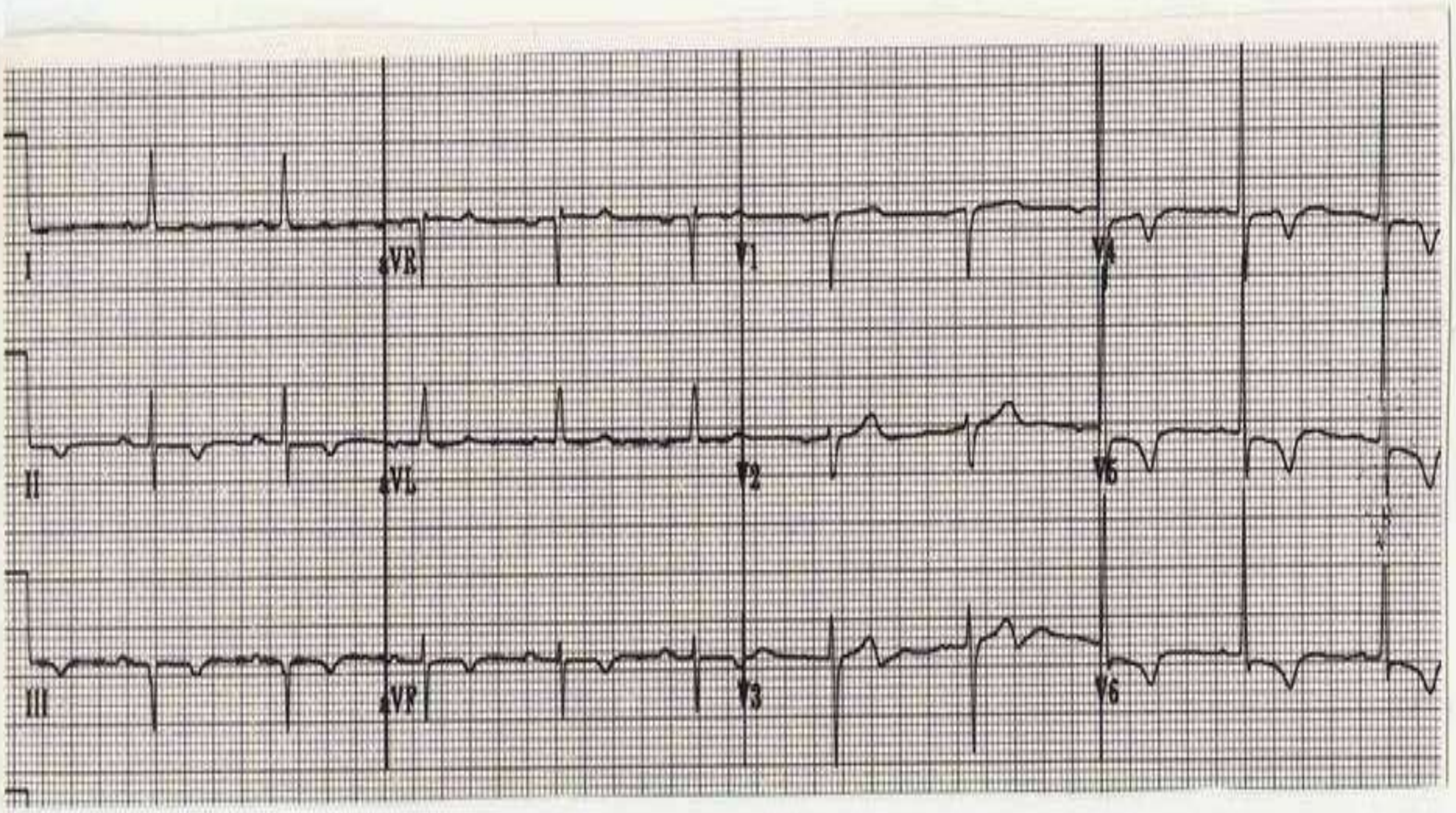
*ECG 11

2/15/2012



*ECG 12

2/15/2012



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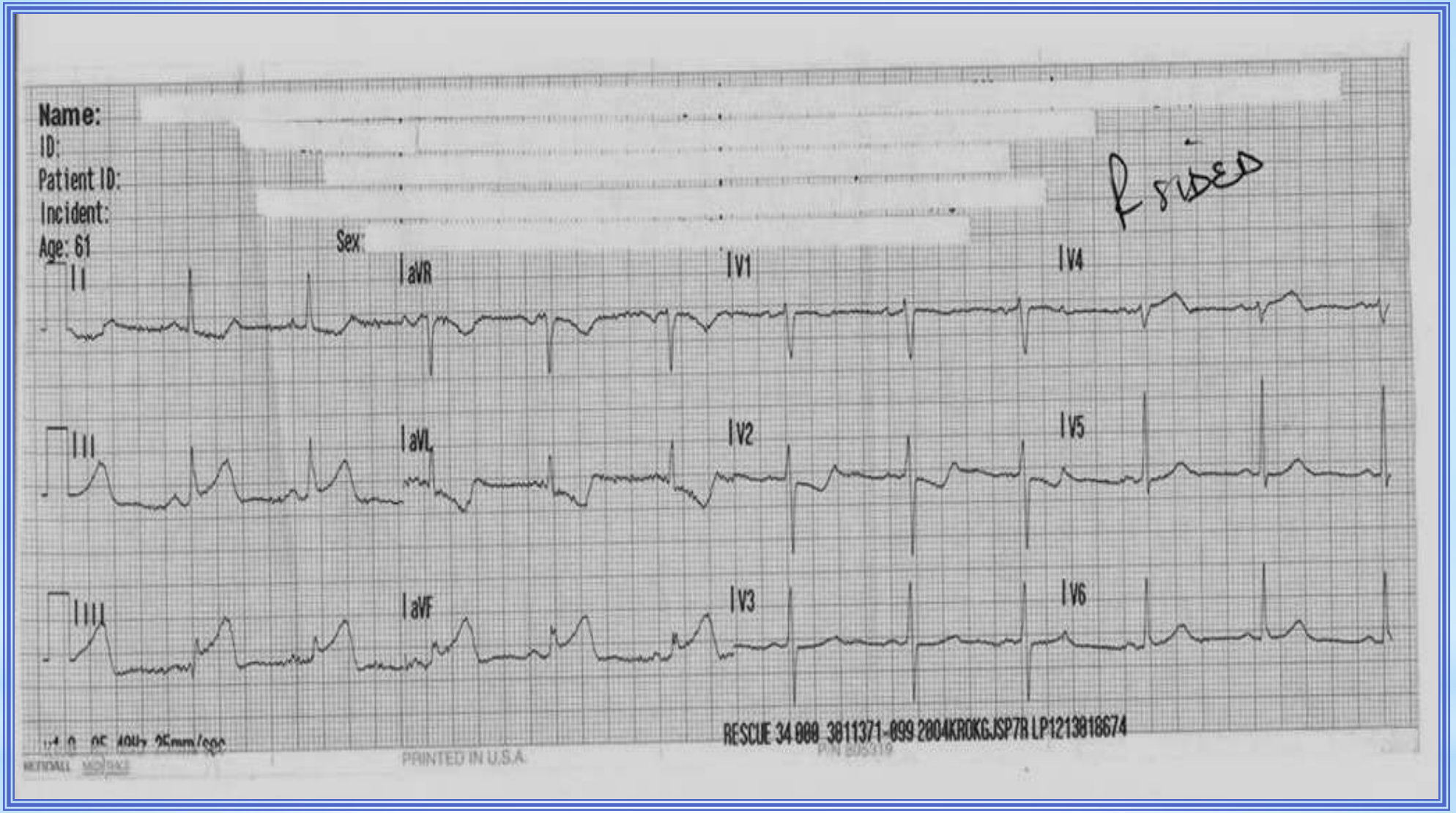

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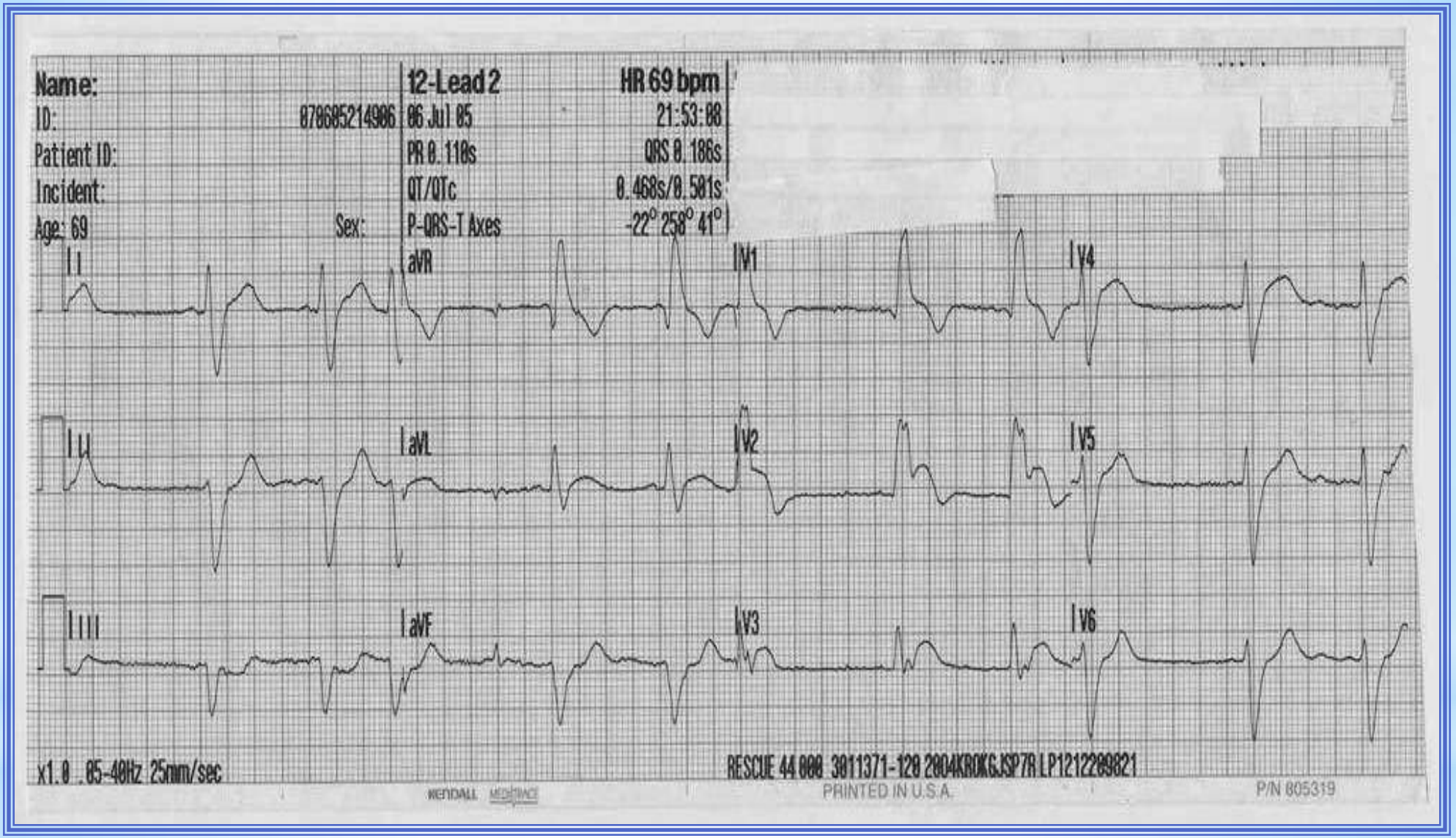

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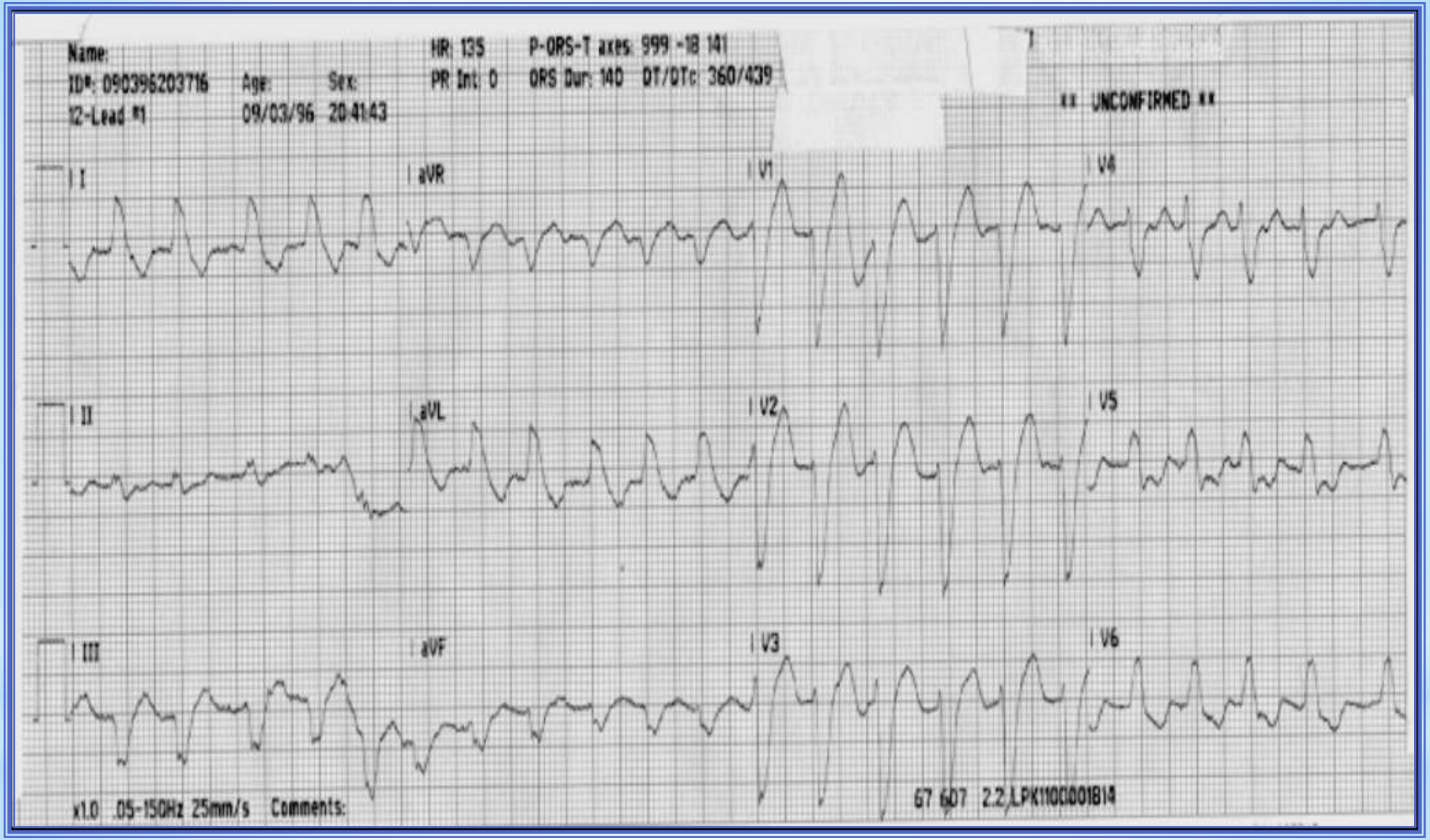

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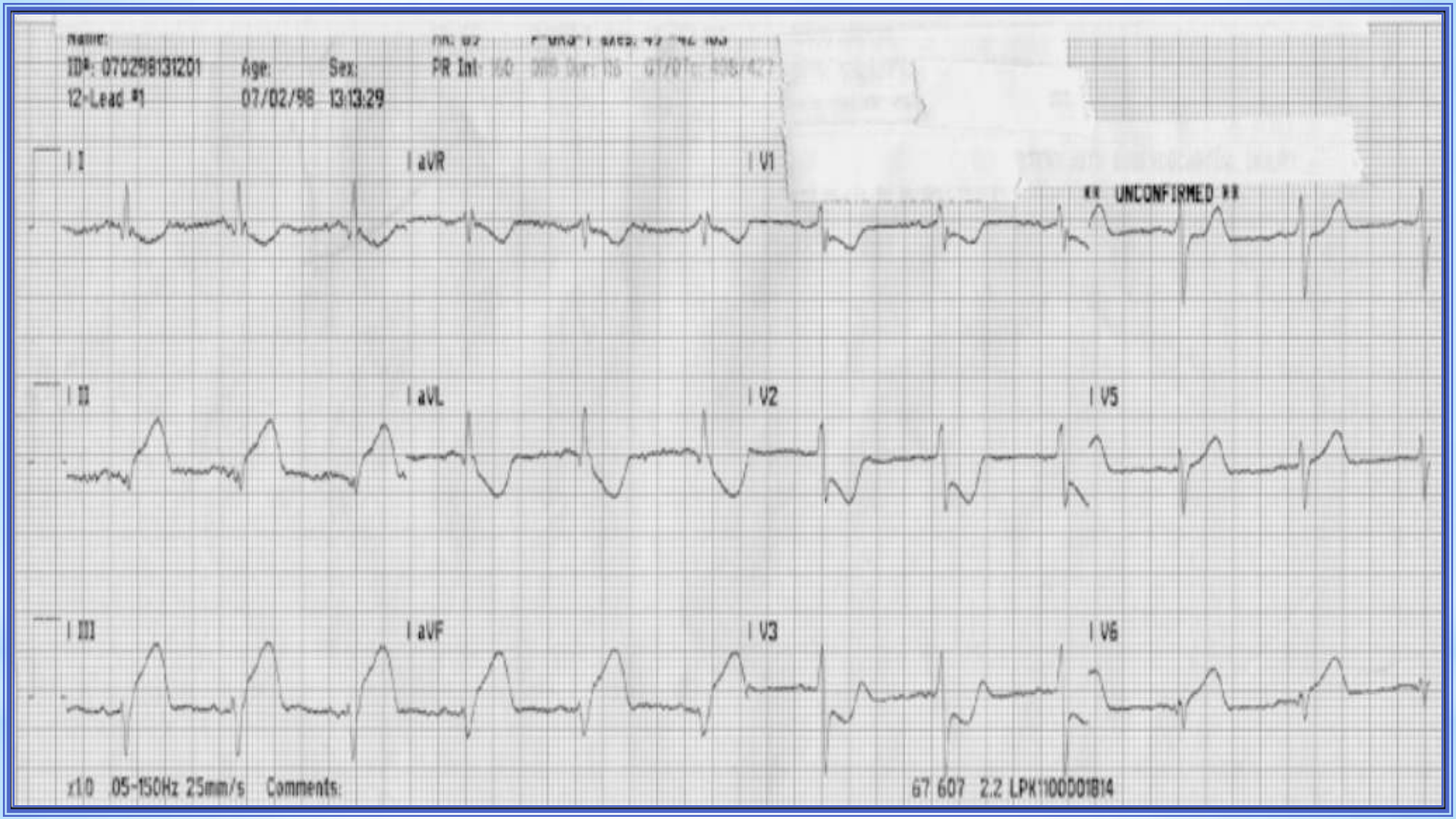

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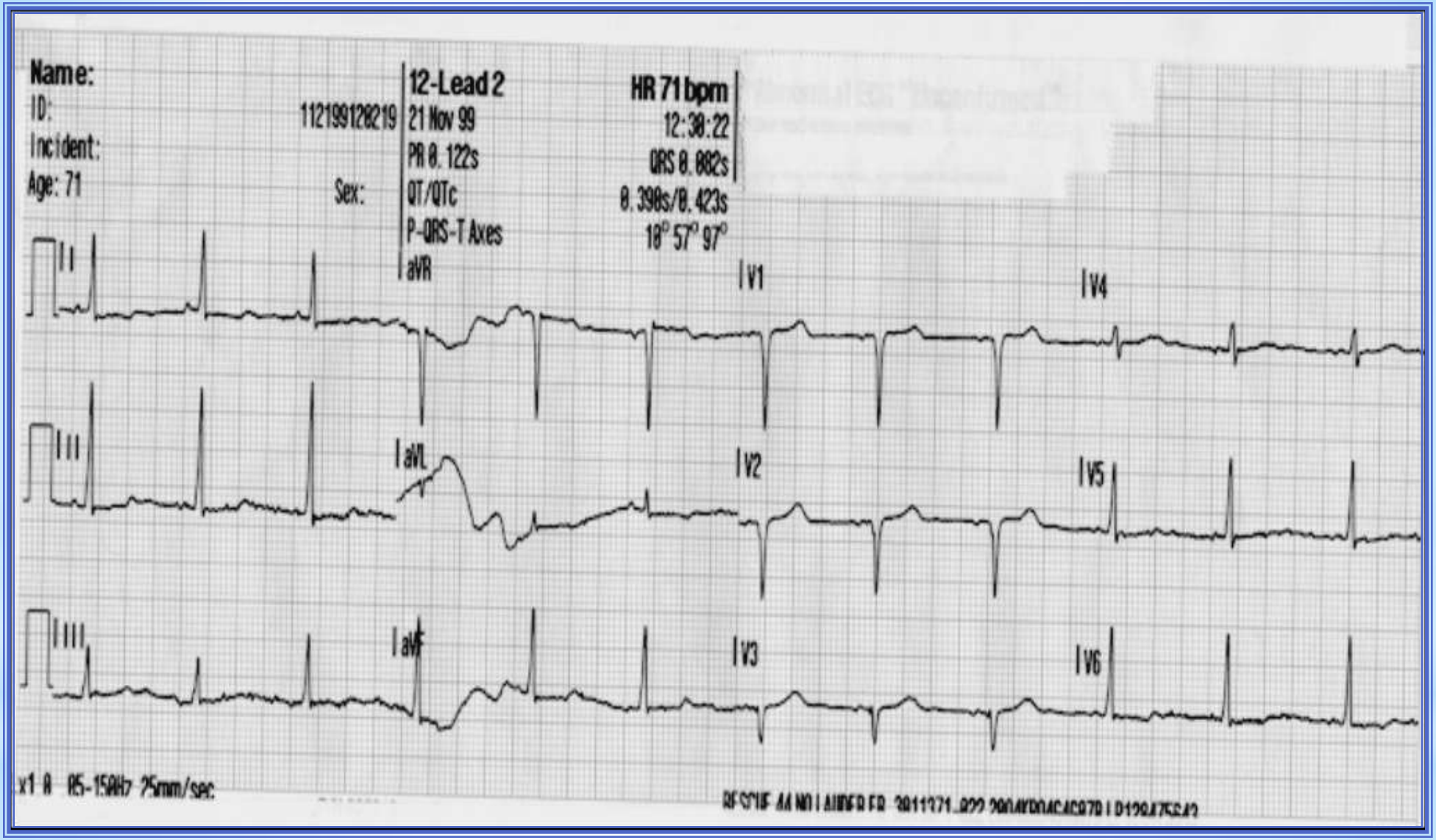

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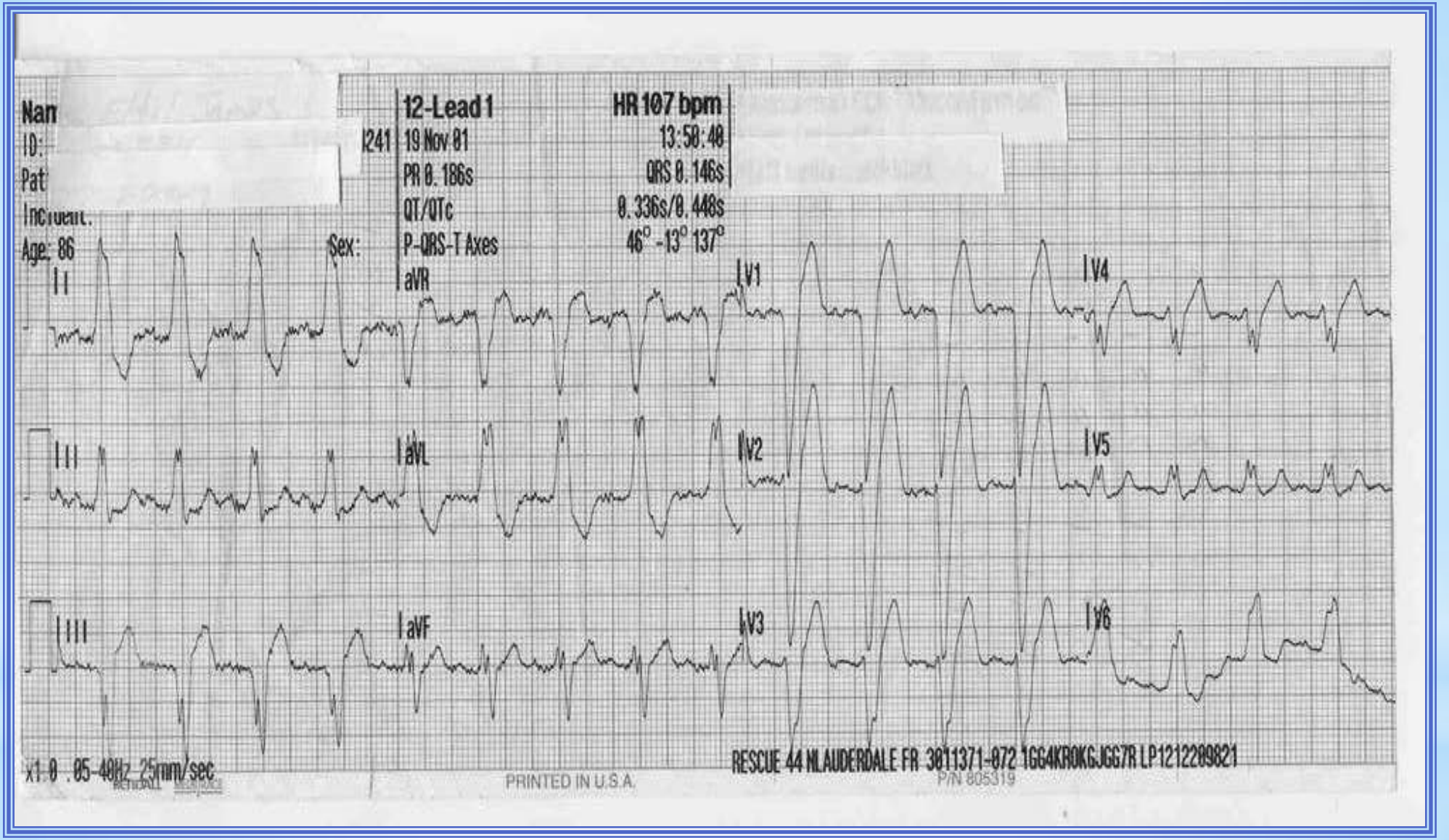

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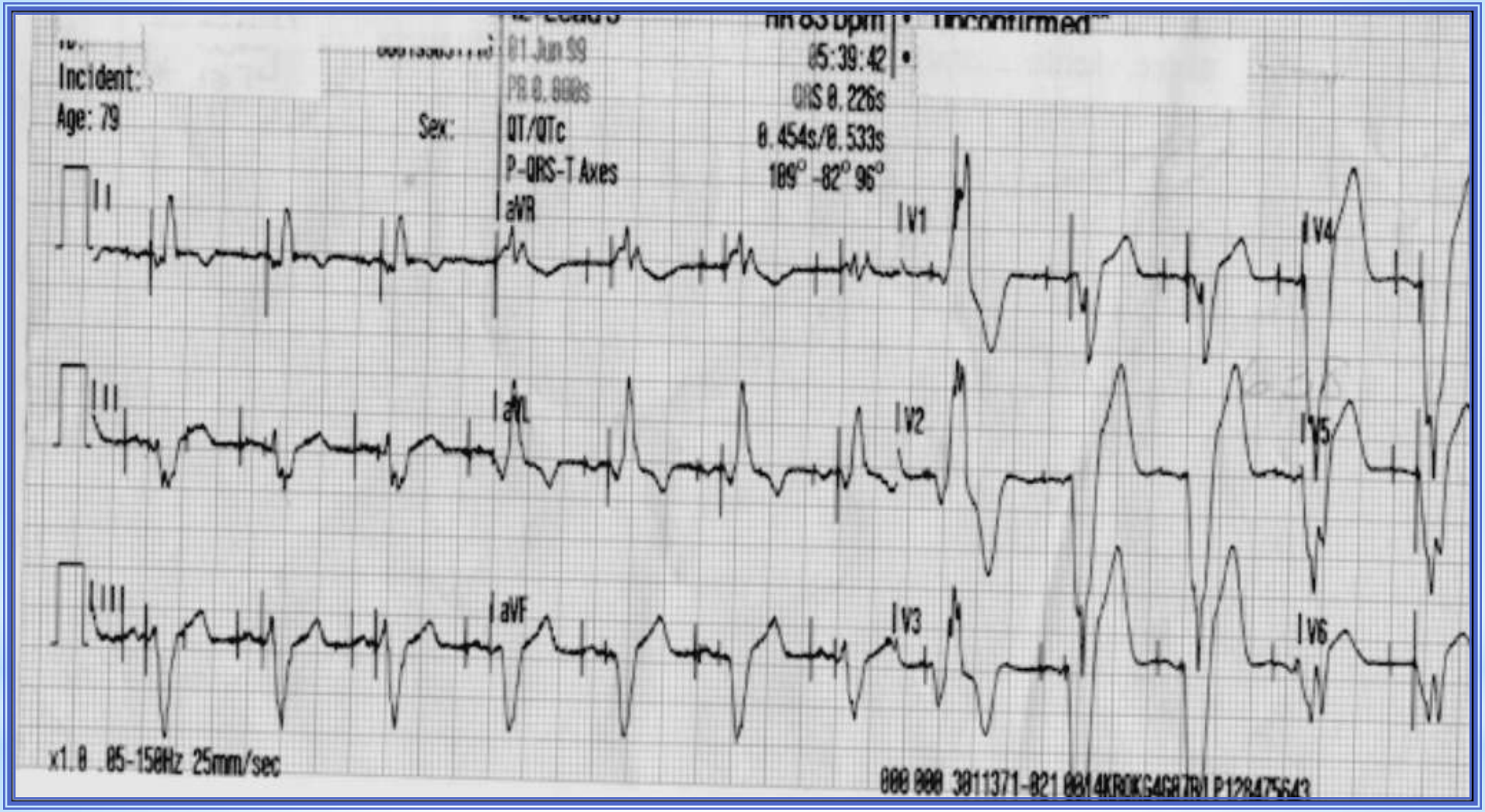

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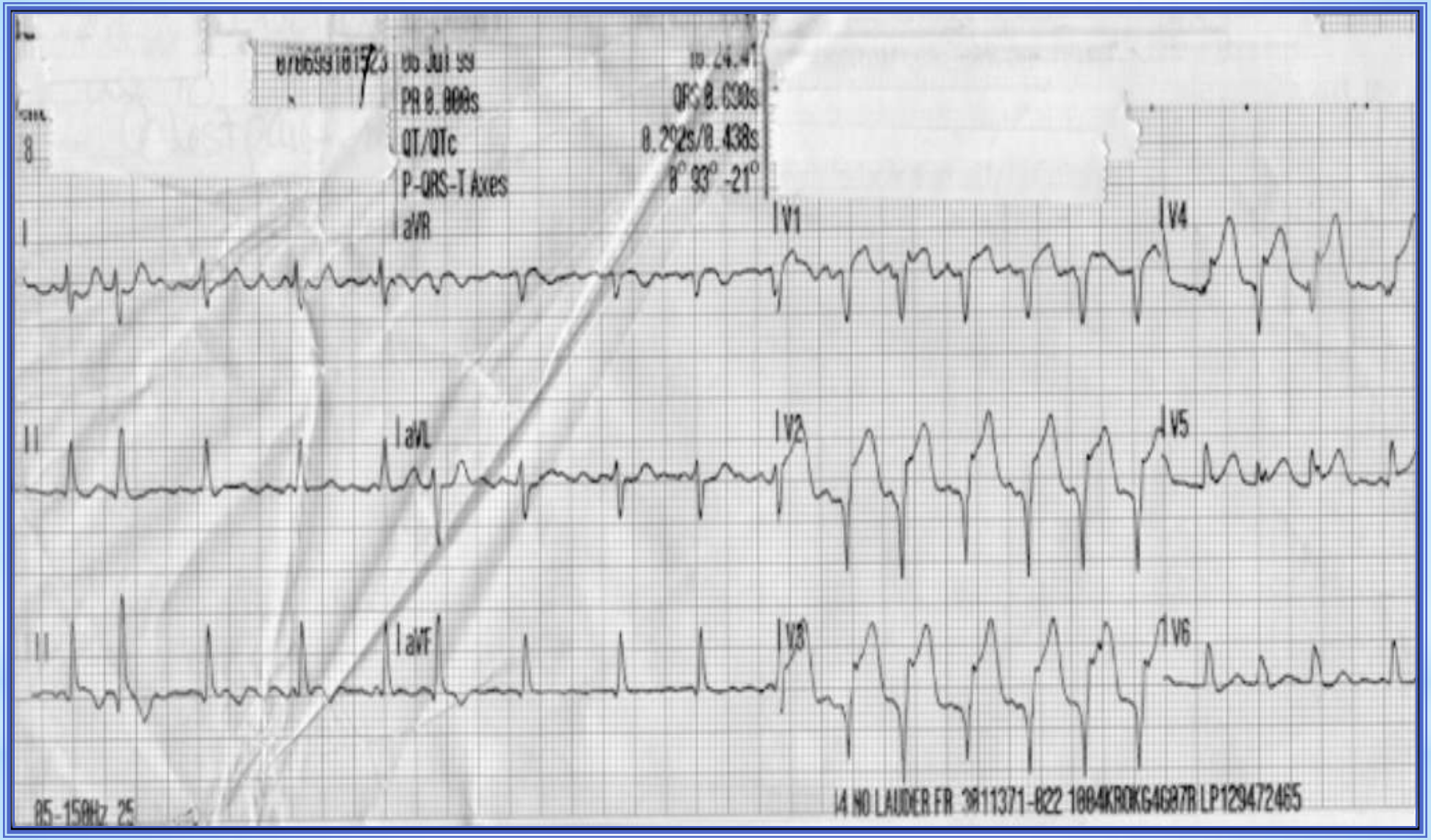

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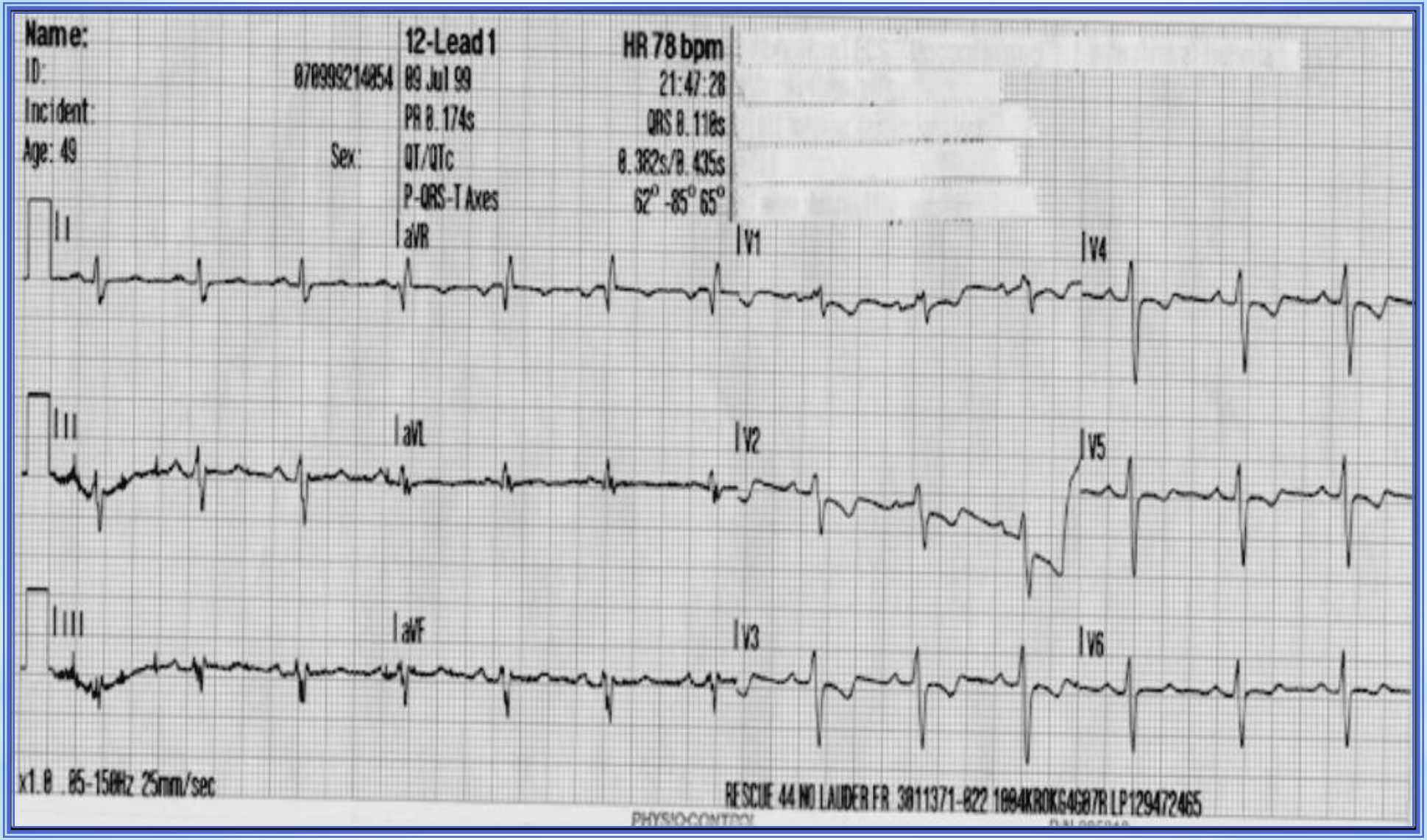

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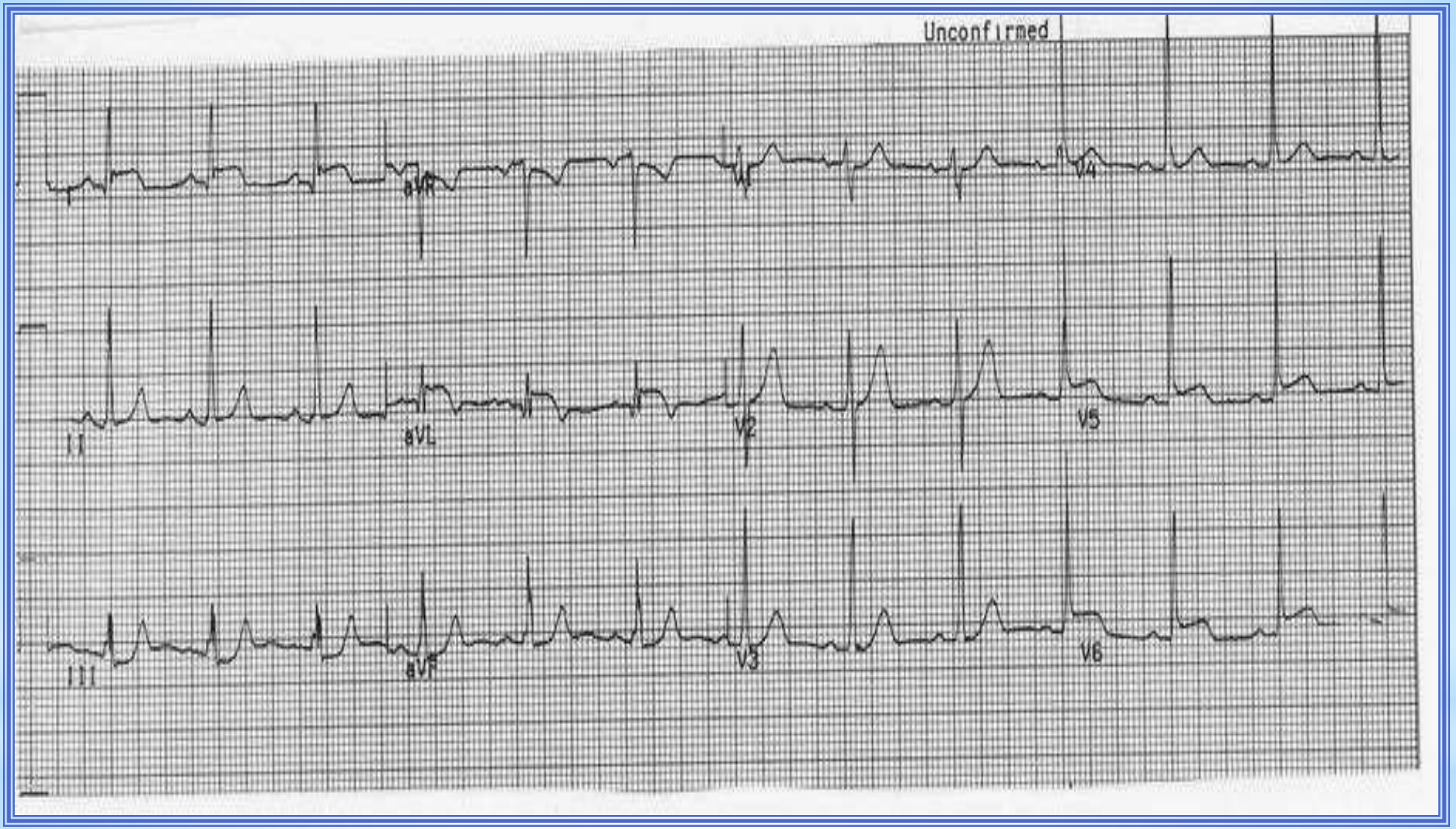

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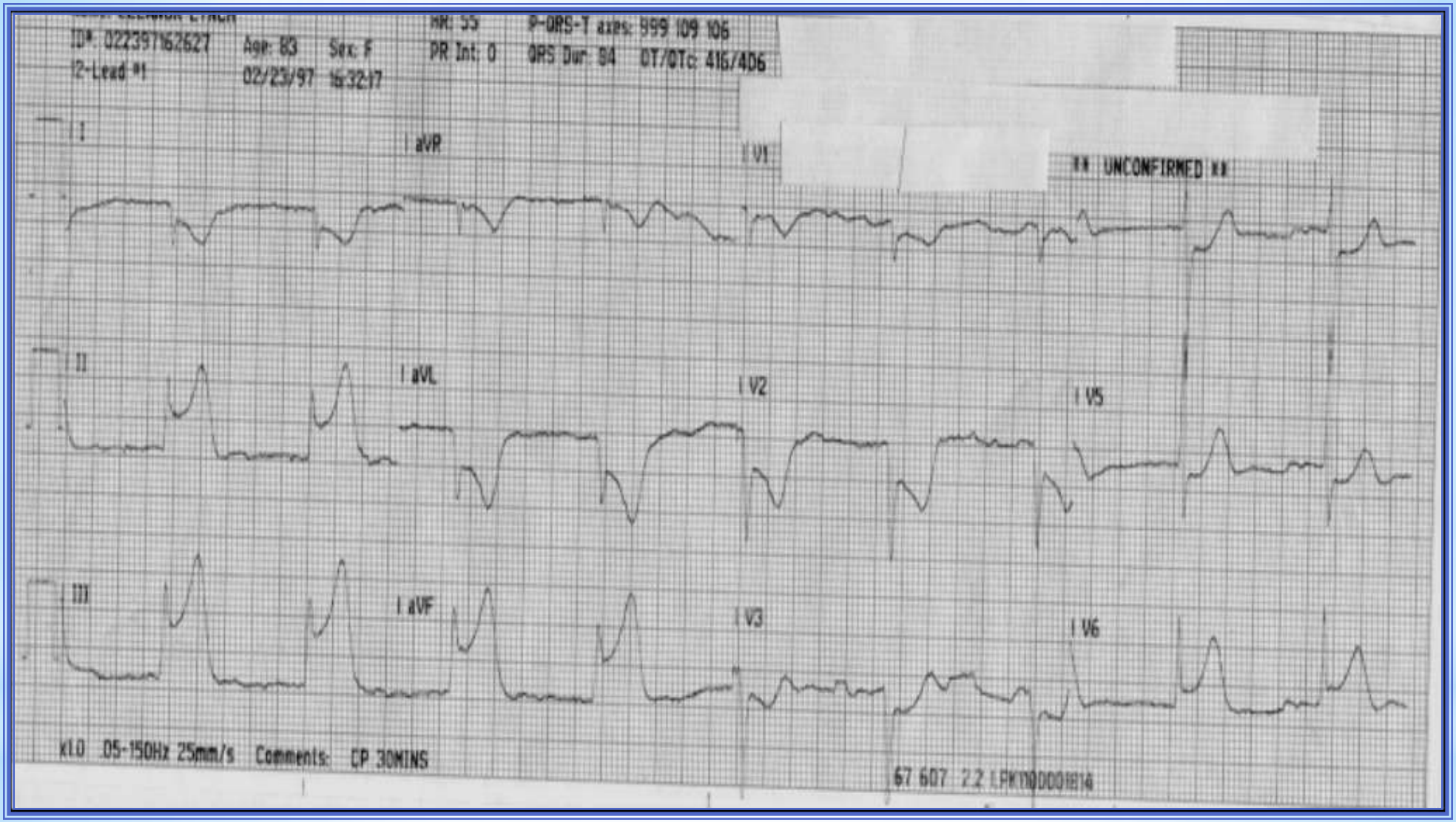
2/15/2012



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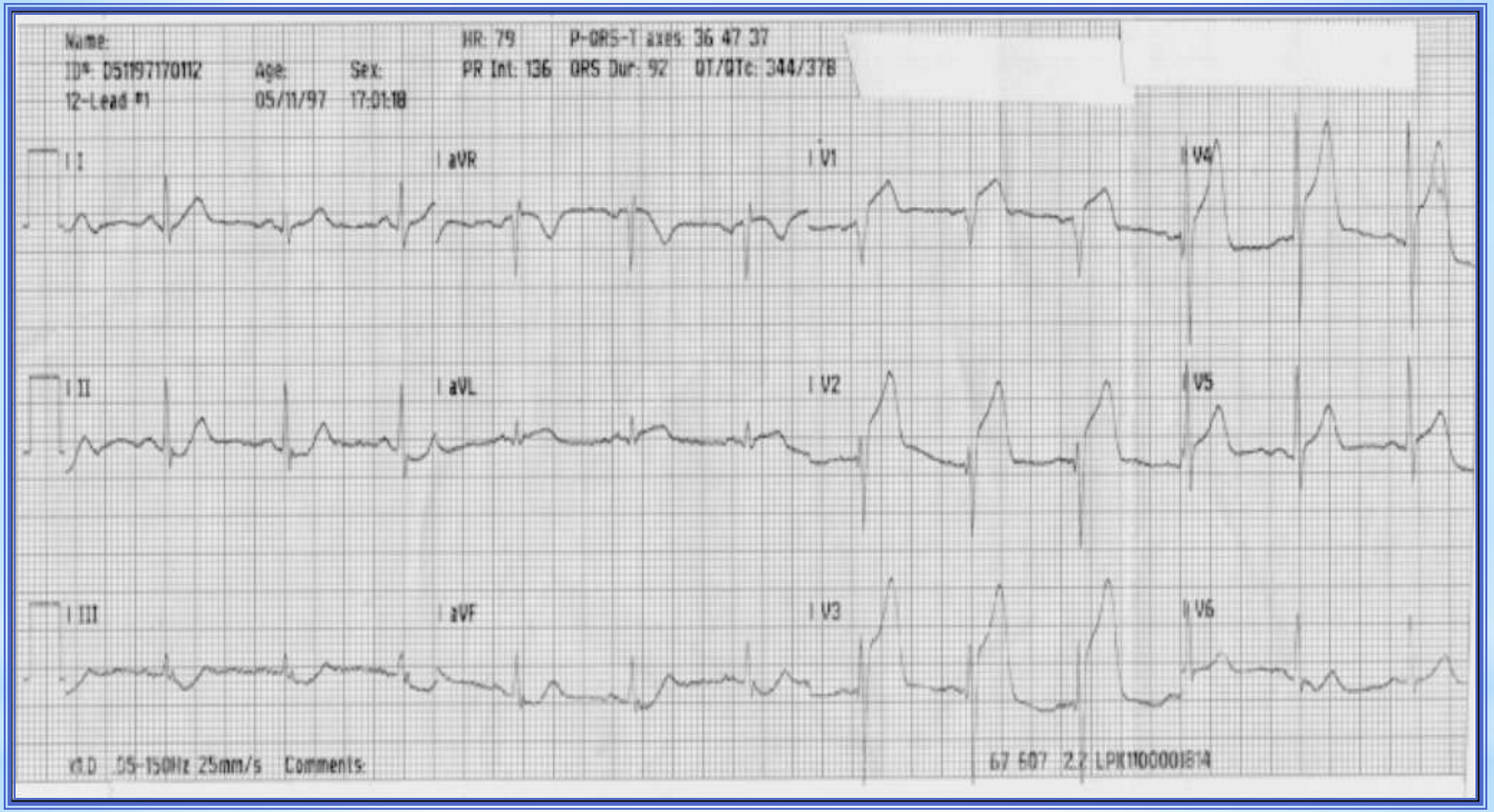

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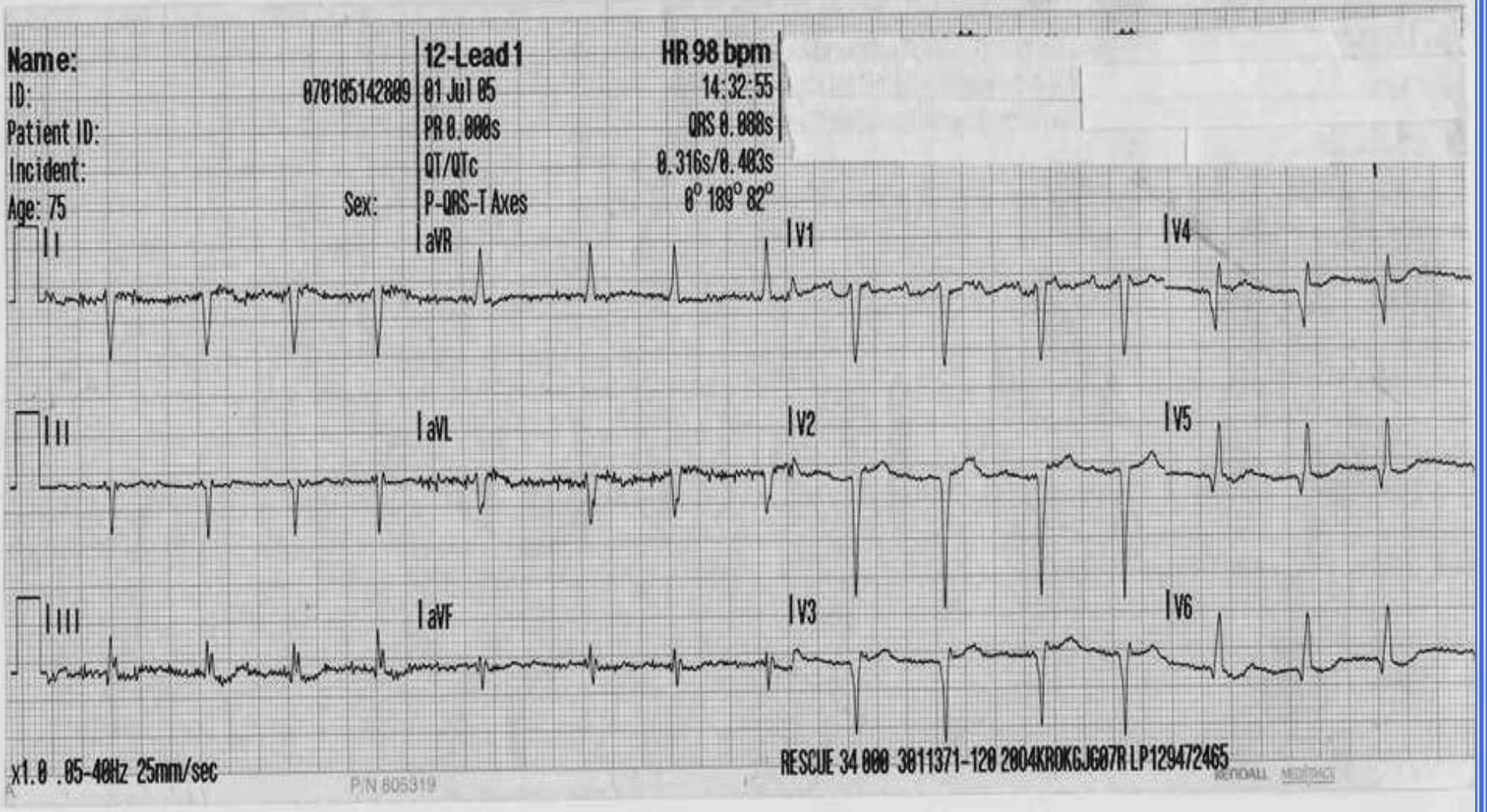

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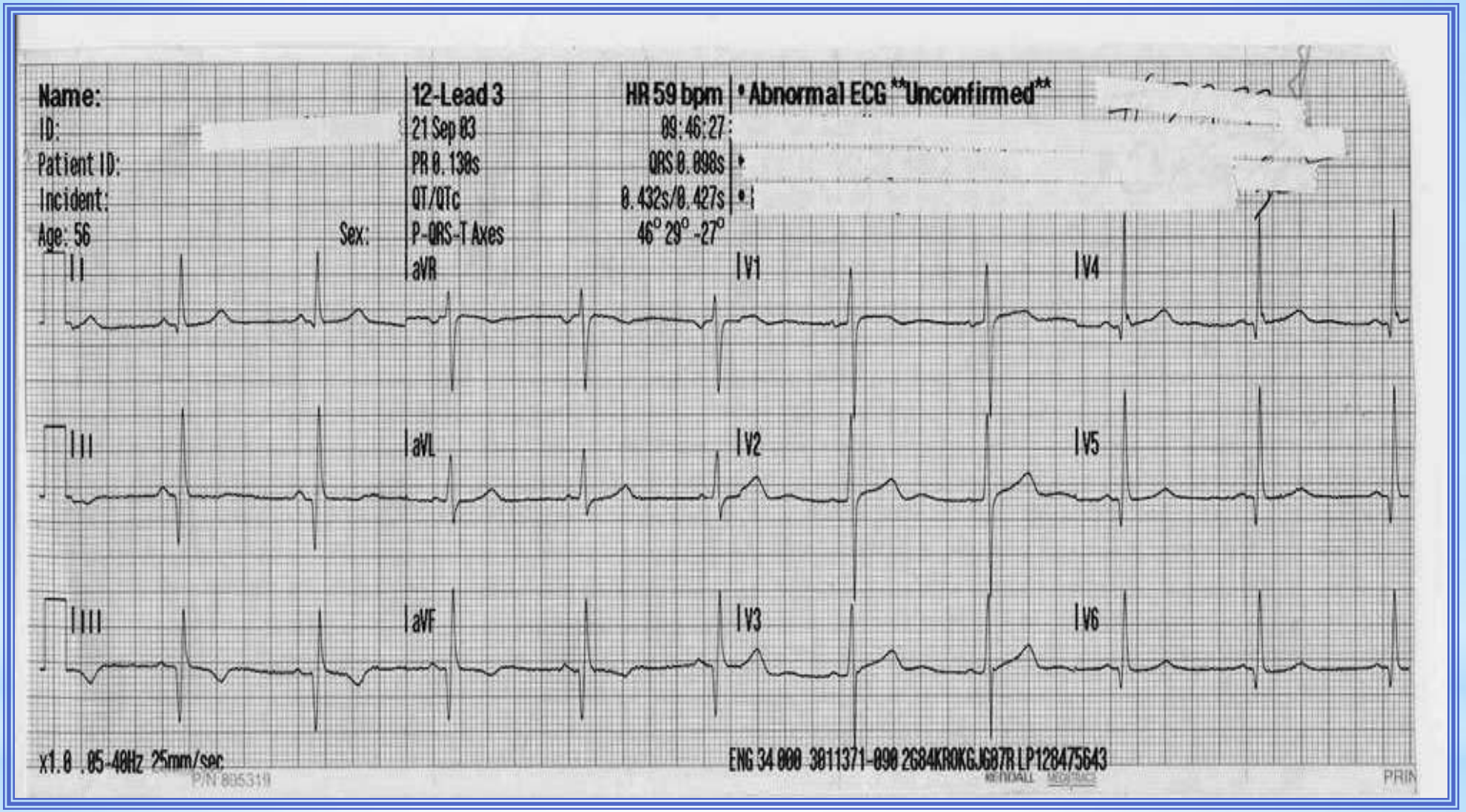
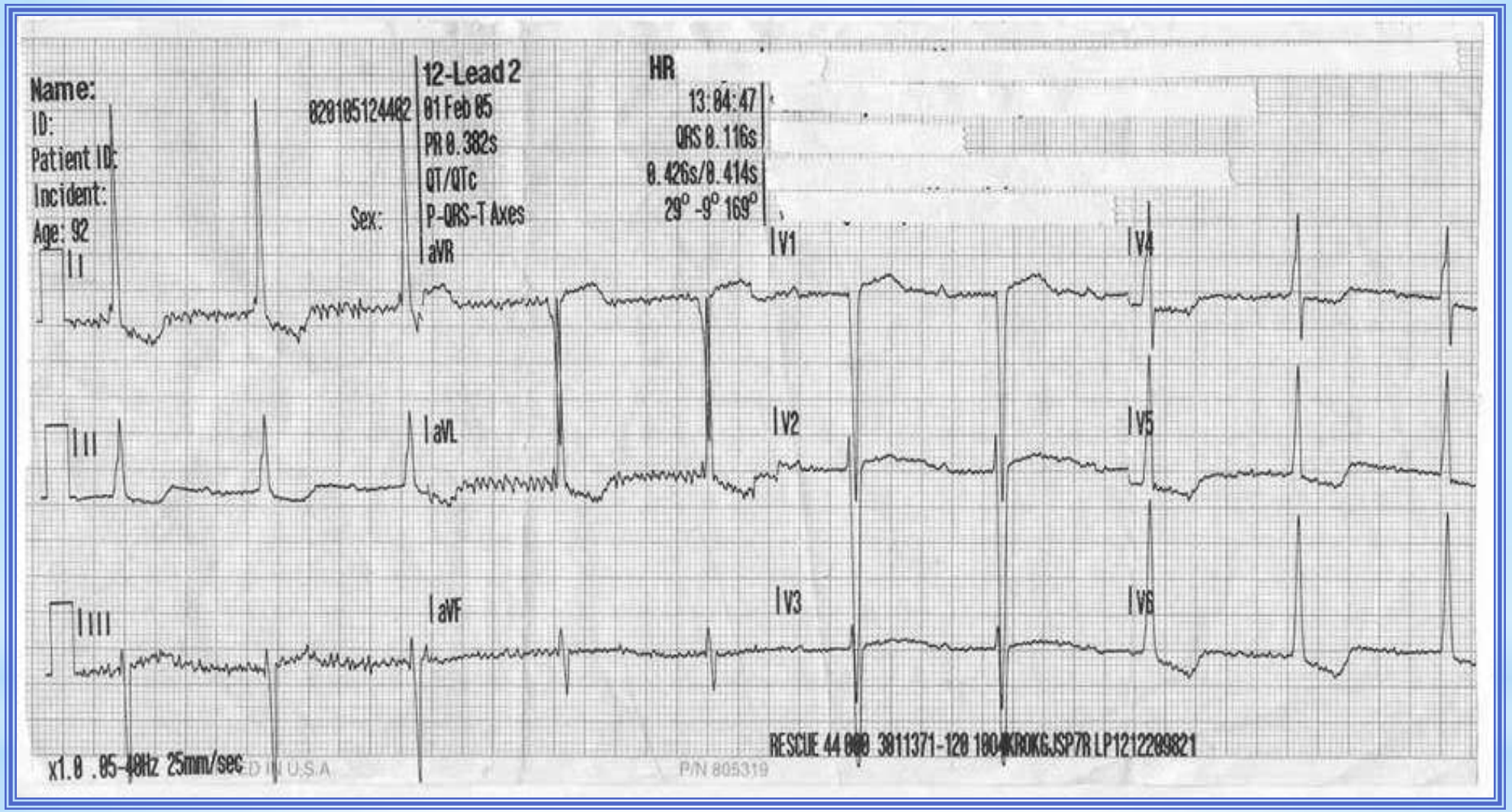


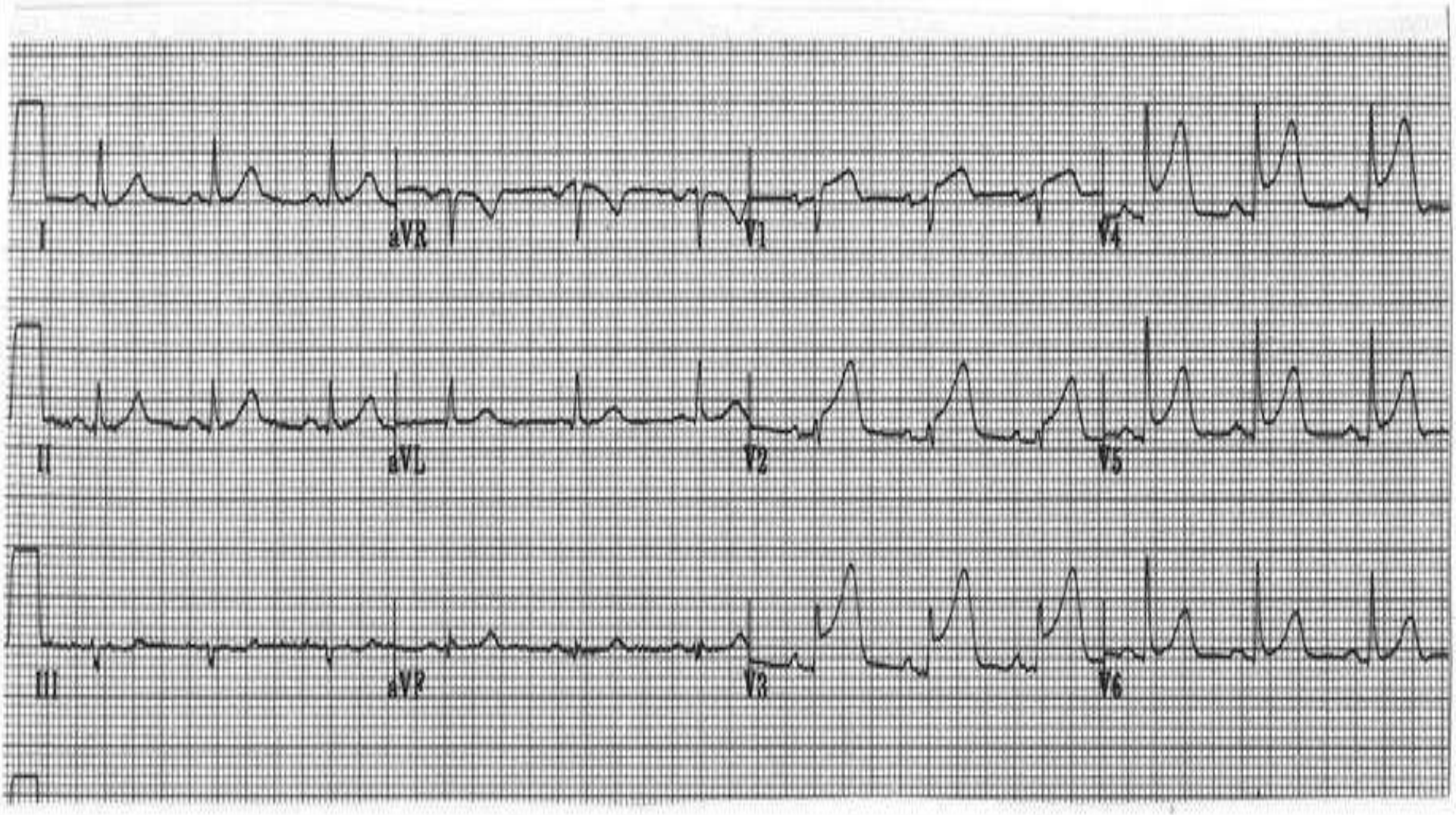
*ECG 27

2/15/2012



*ECG 28

2/15/2012



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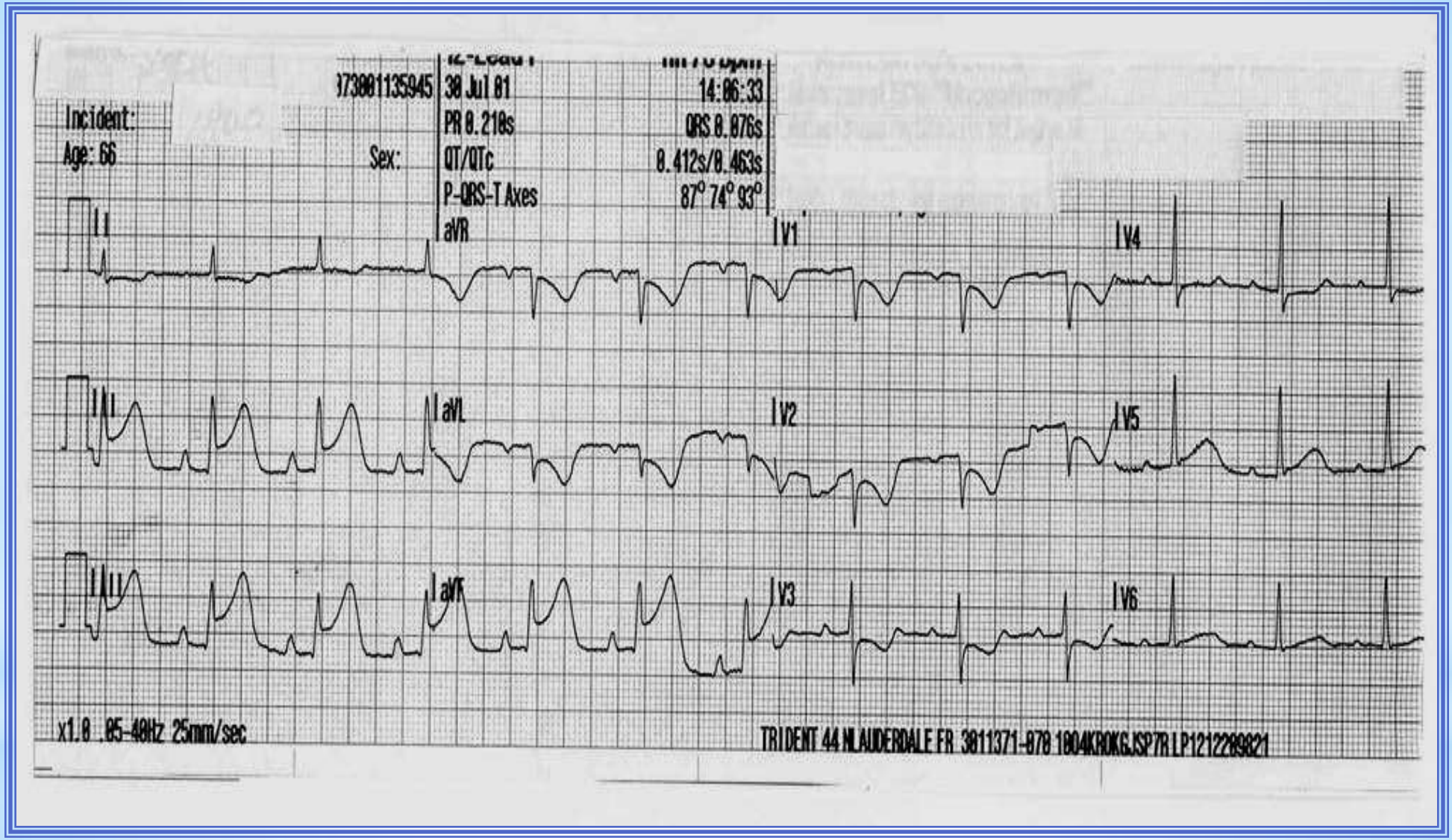
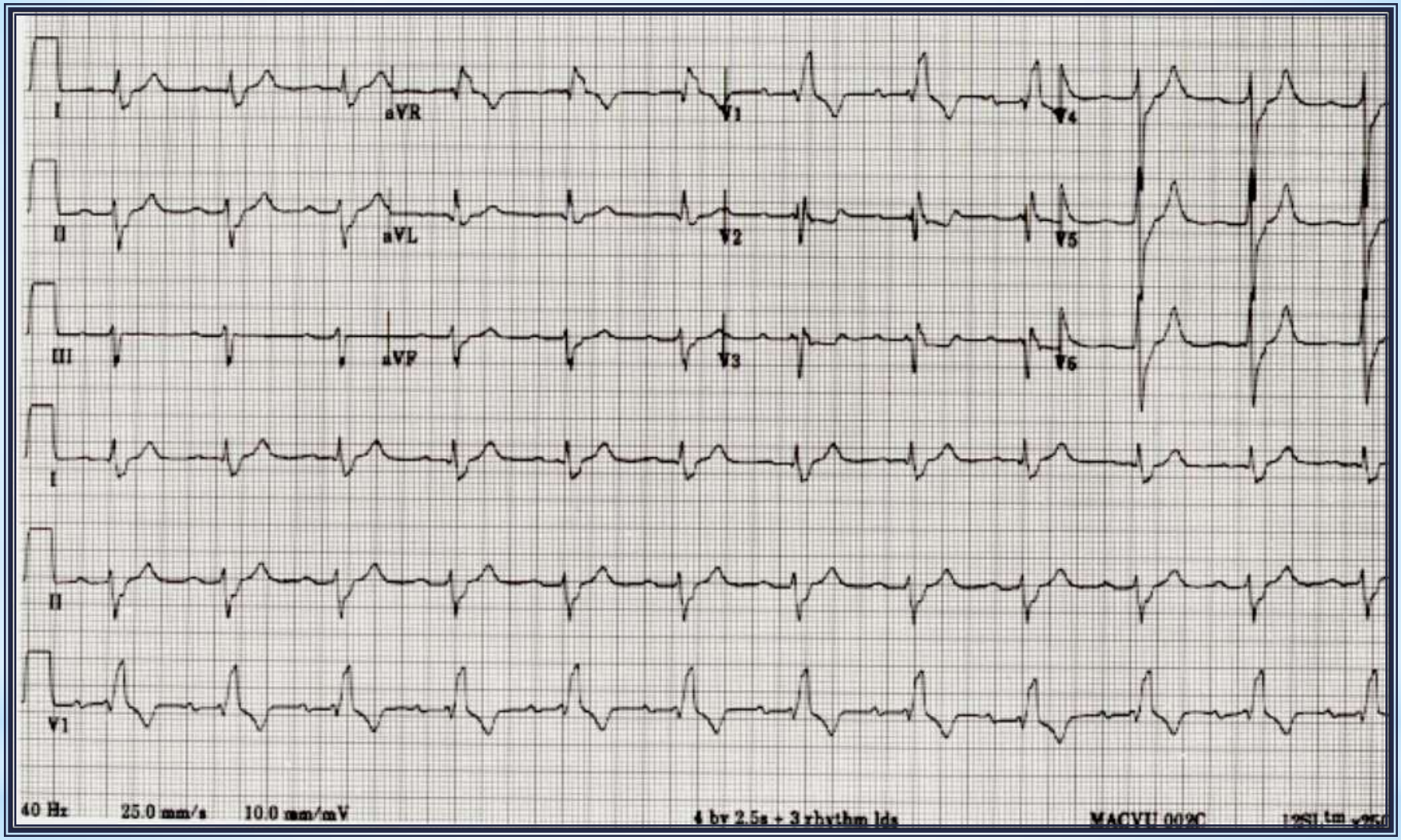
2/15/2012



*ECG 30

2/15/2012

Workshop 2



*ECG # 1

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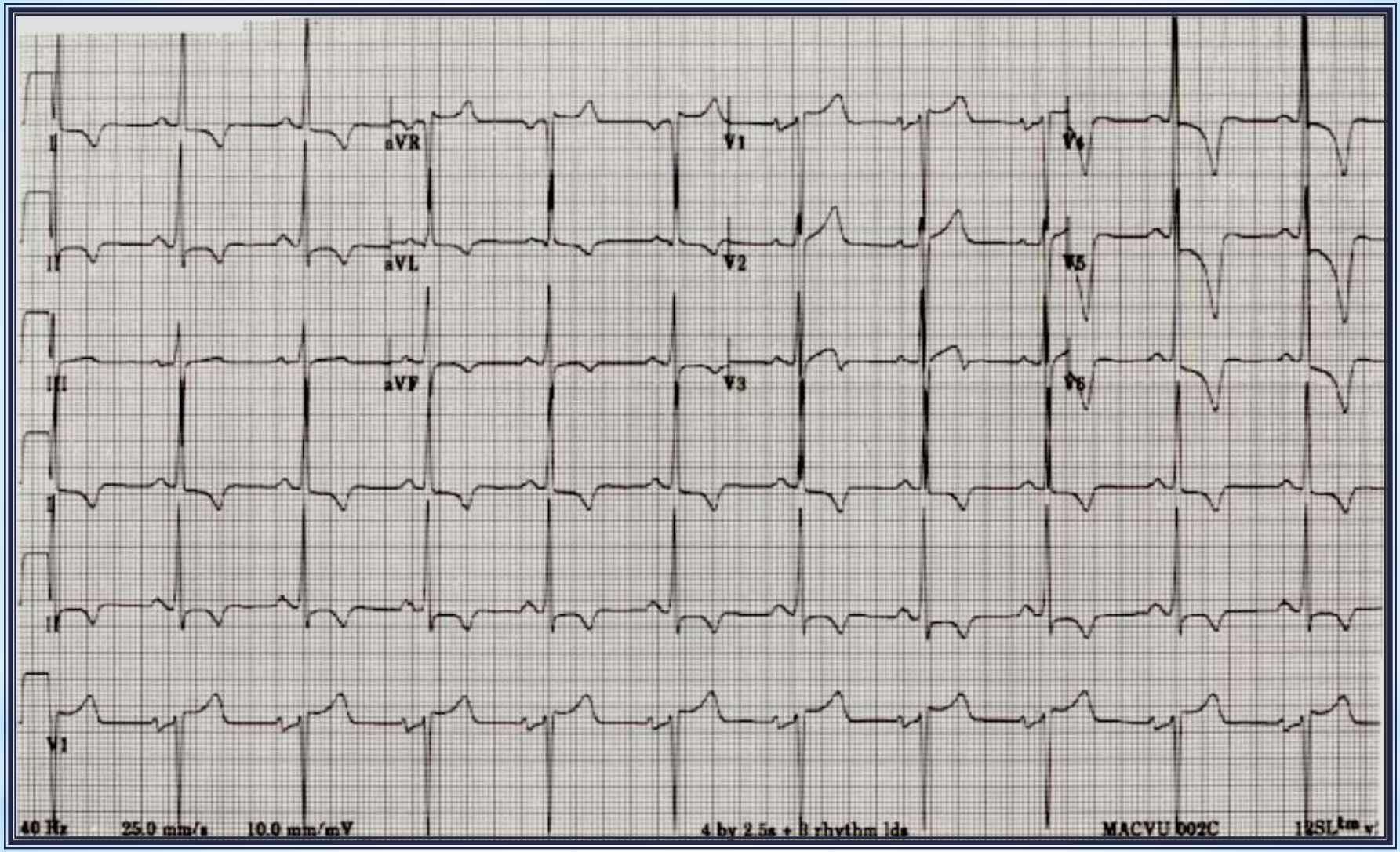

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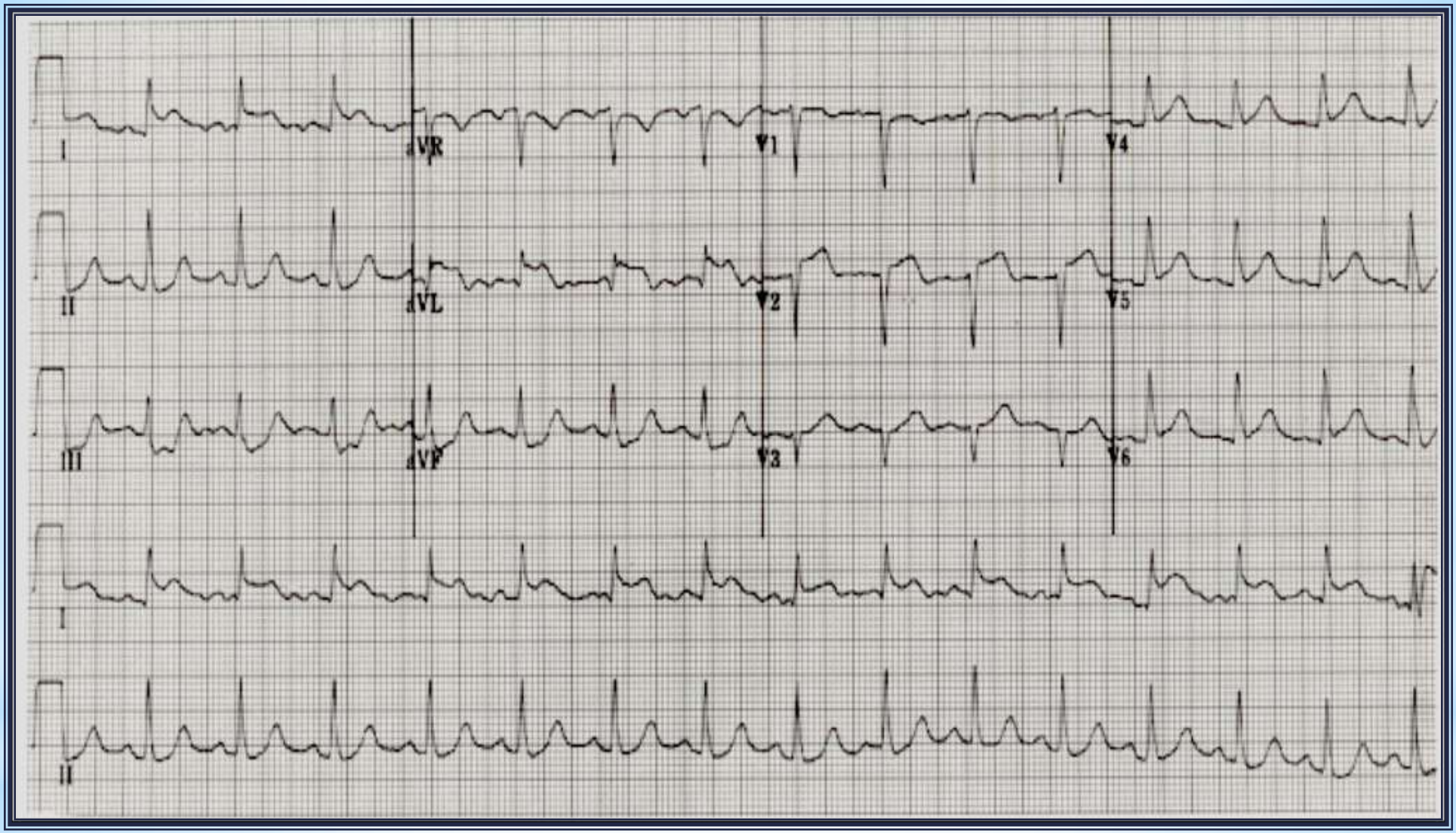

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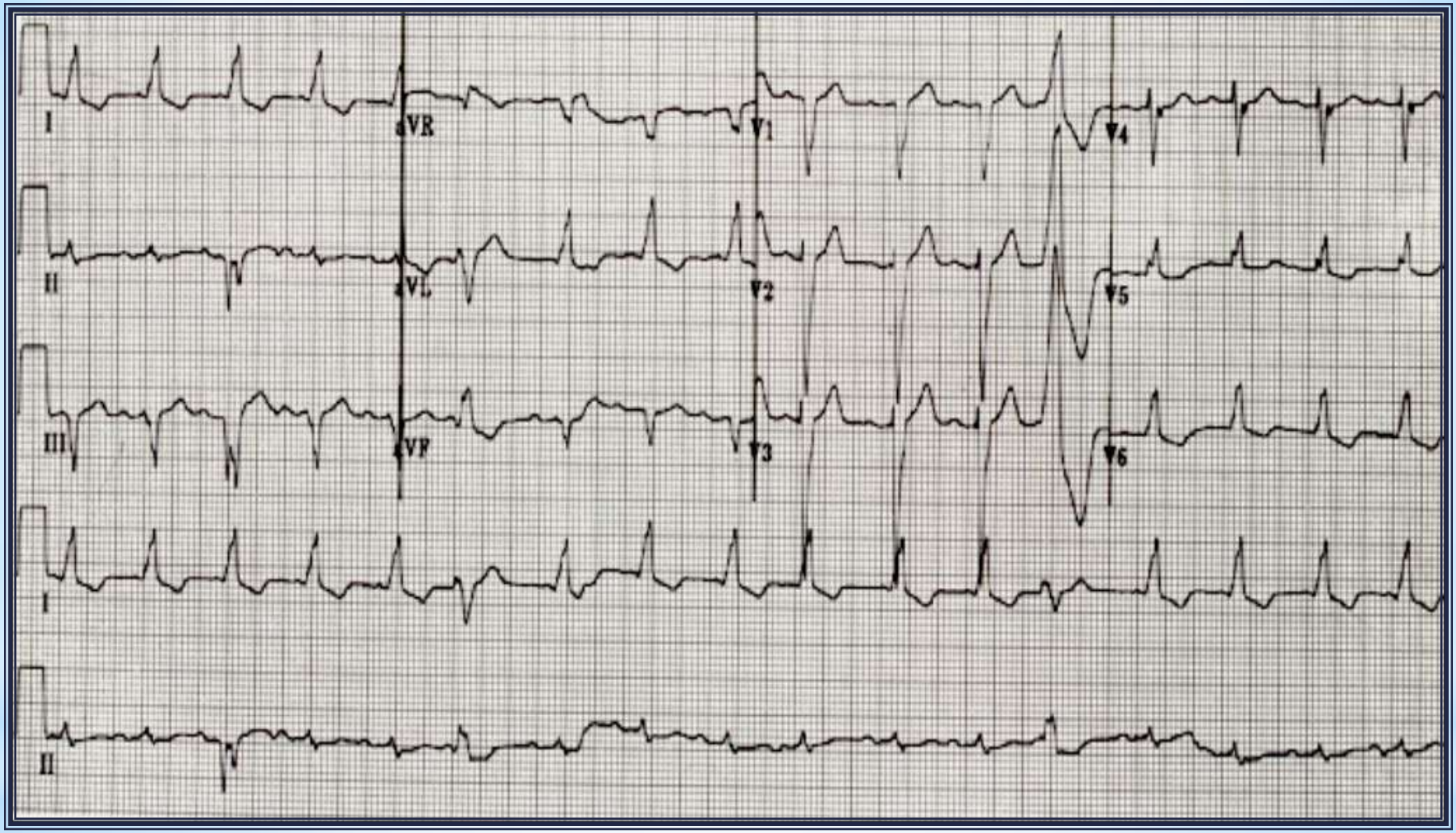

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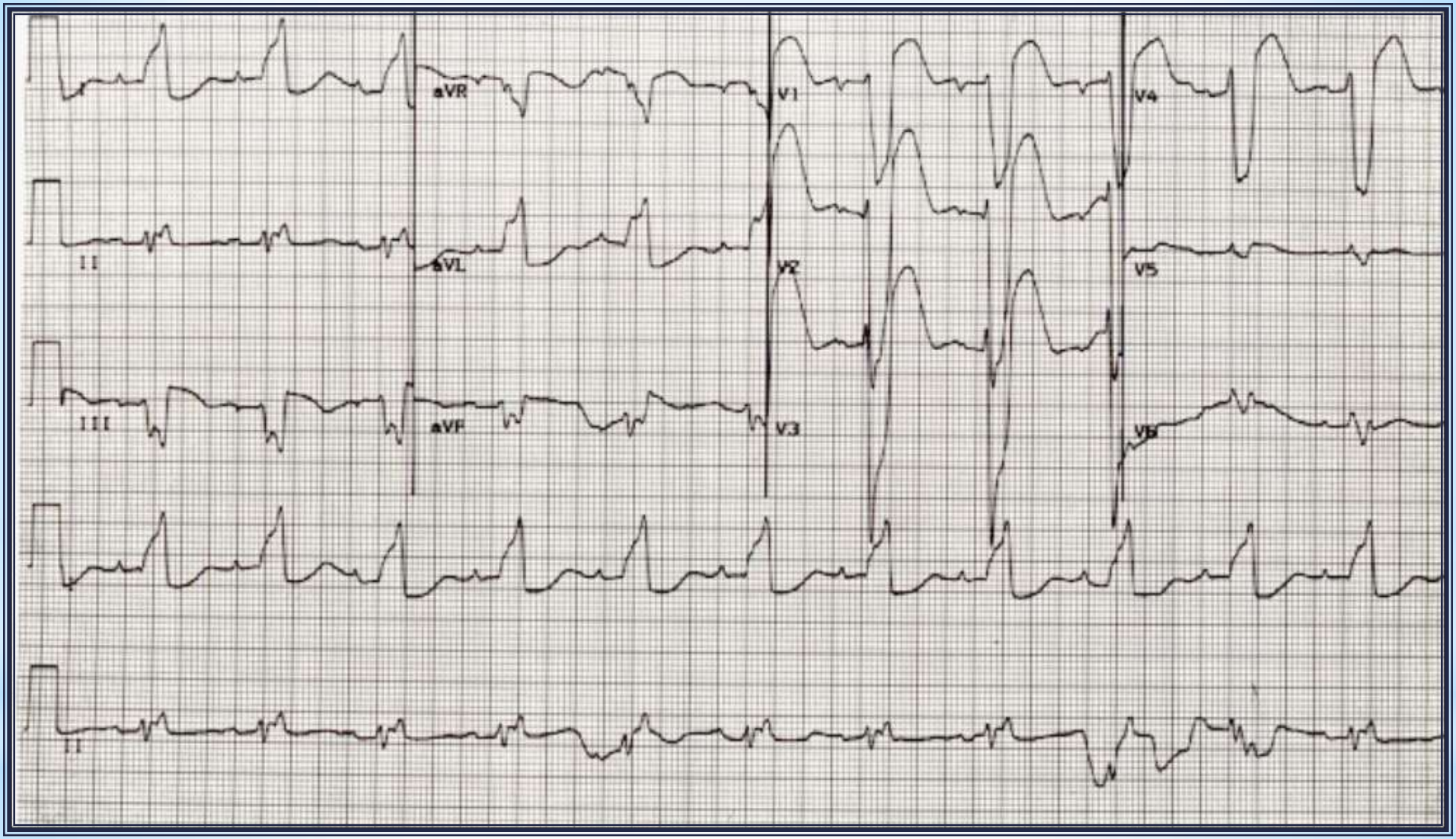

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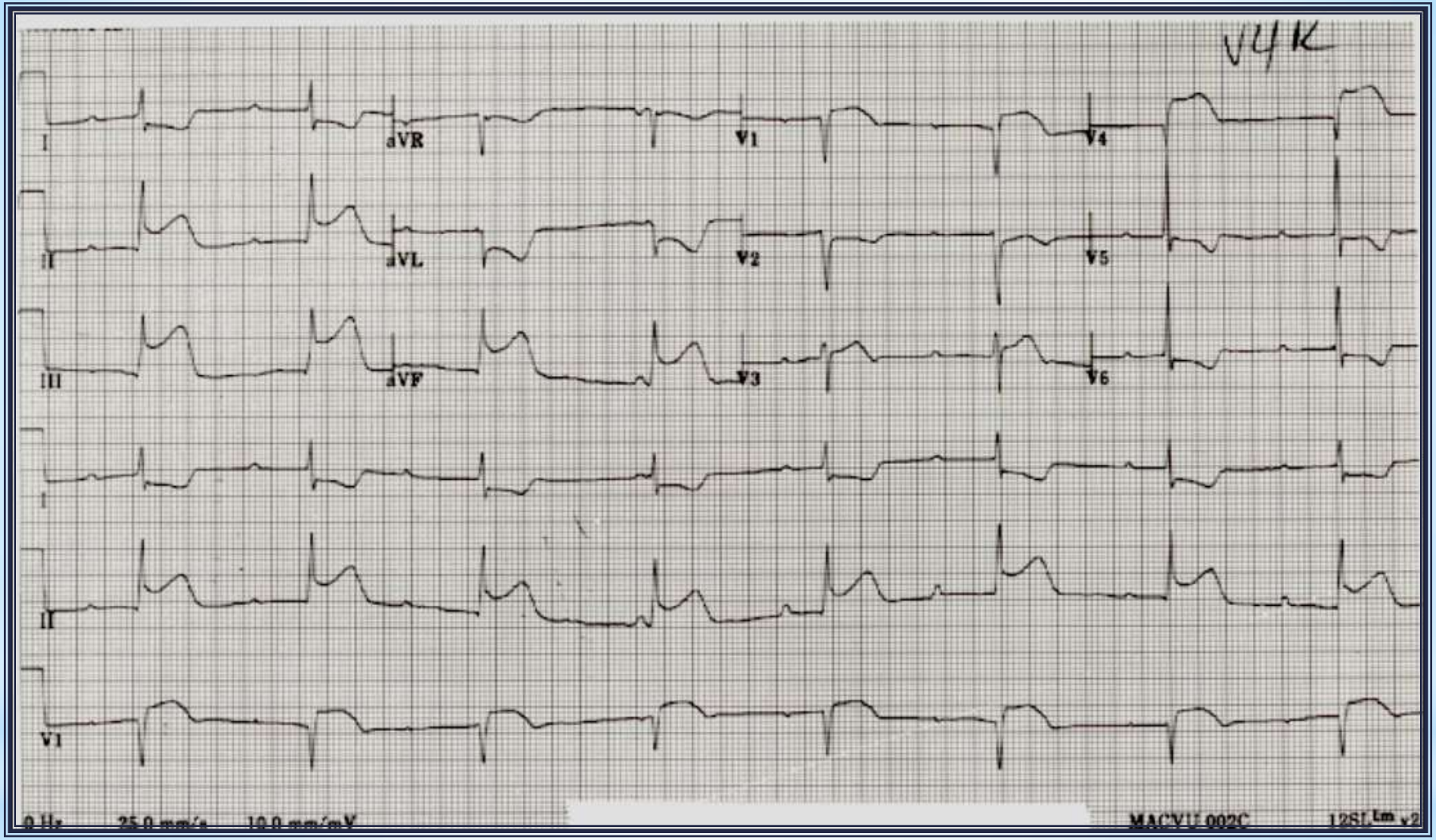

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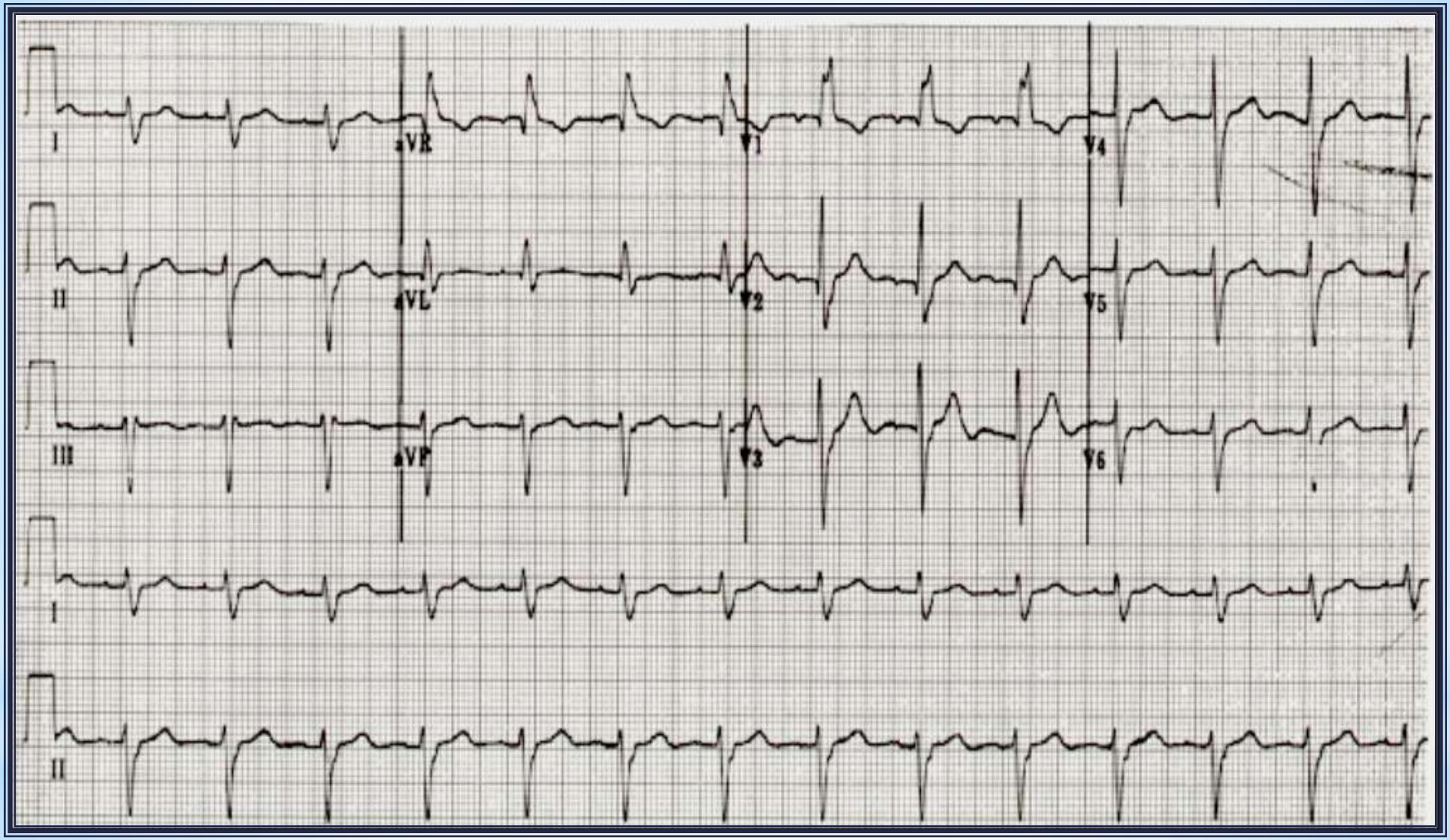

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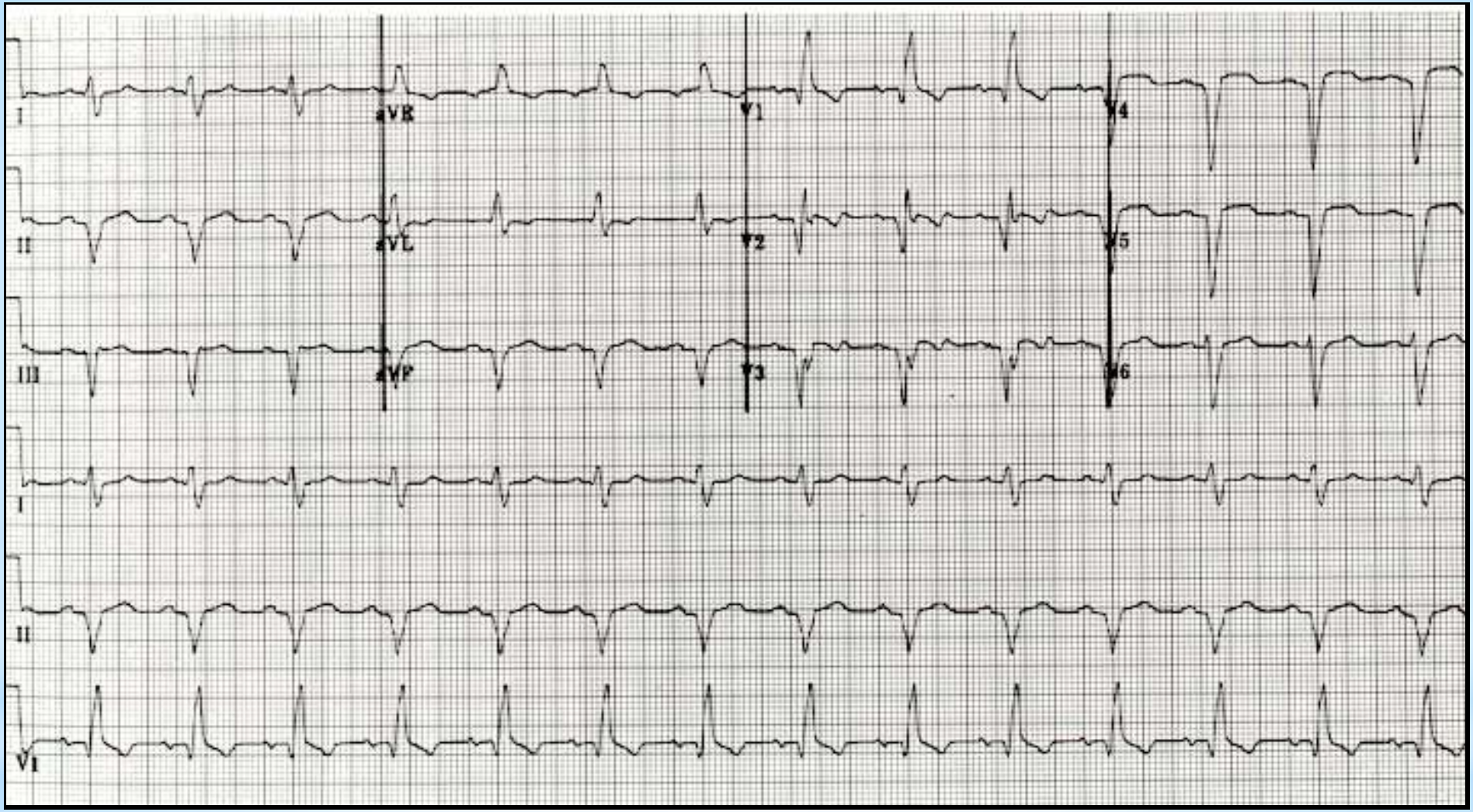

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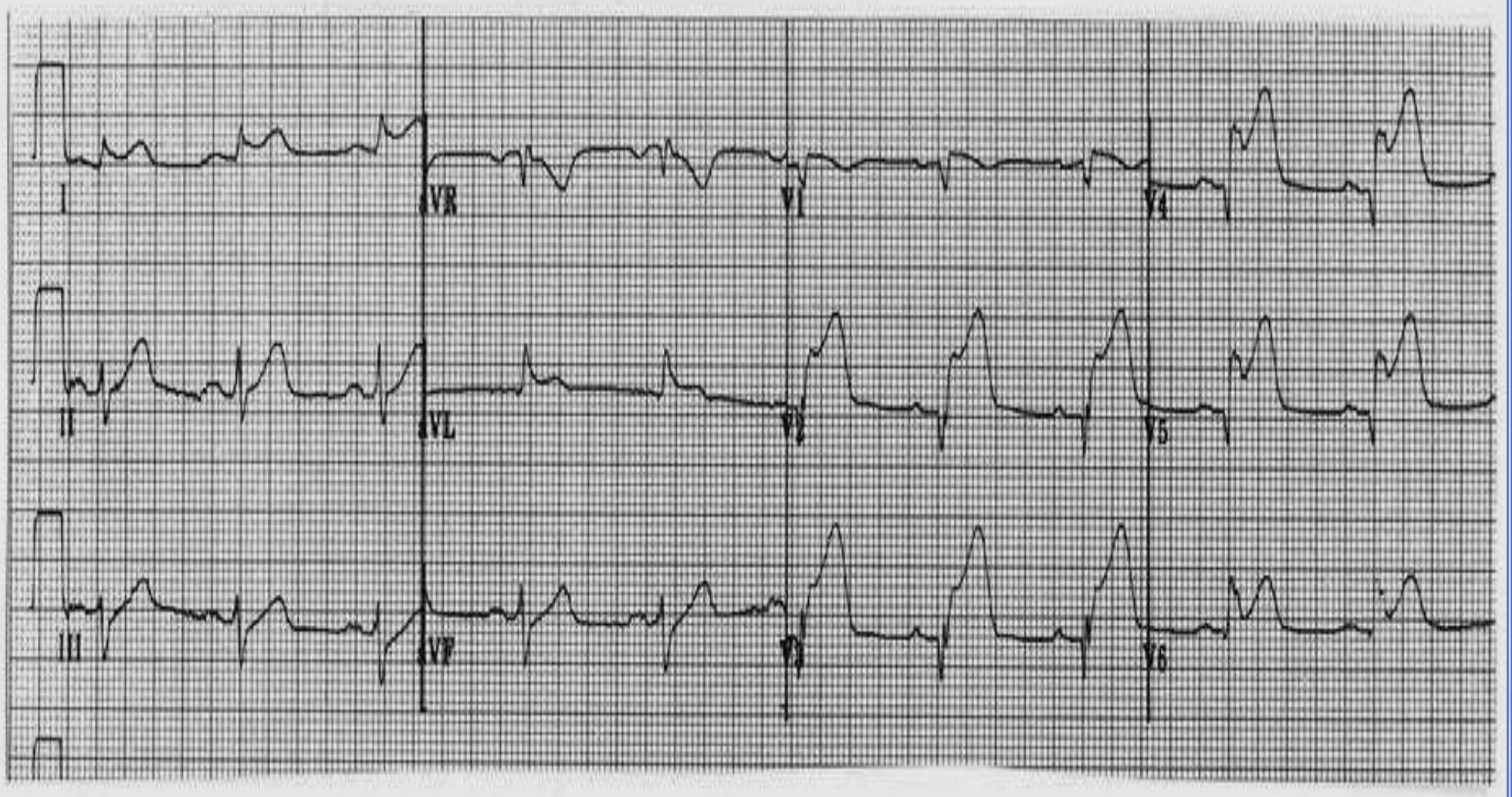

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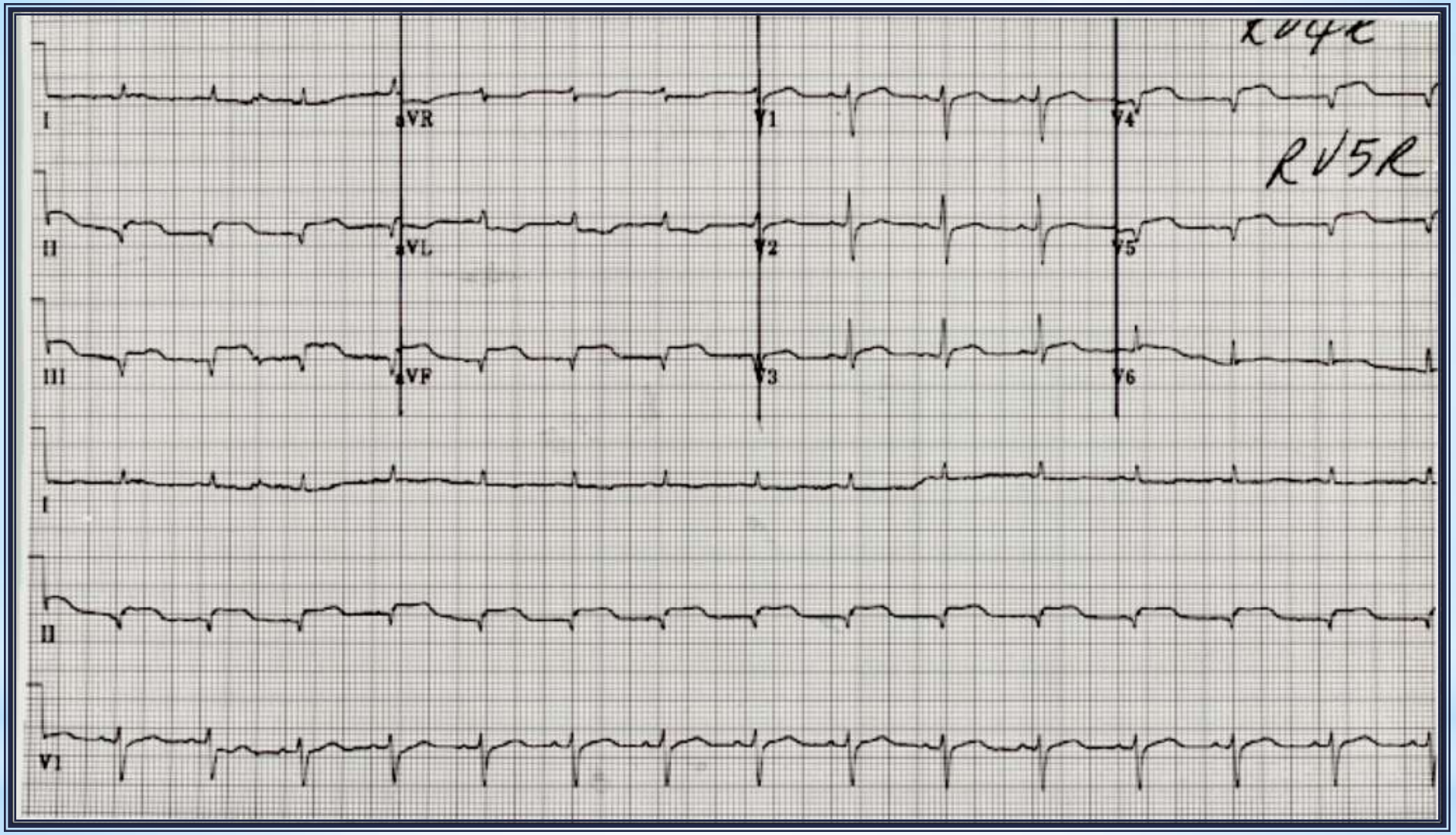

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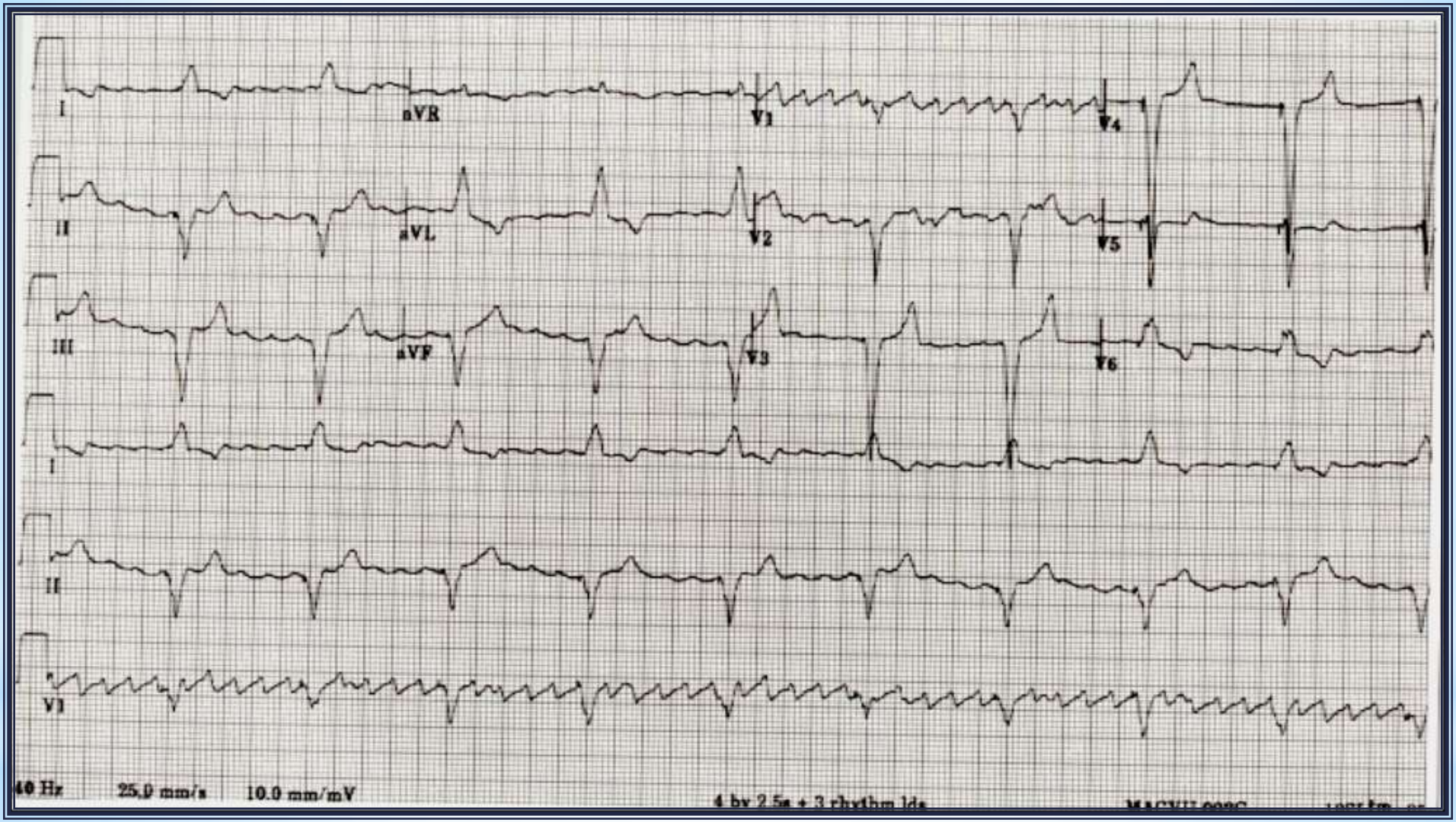

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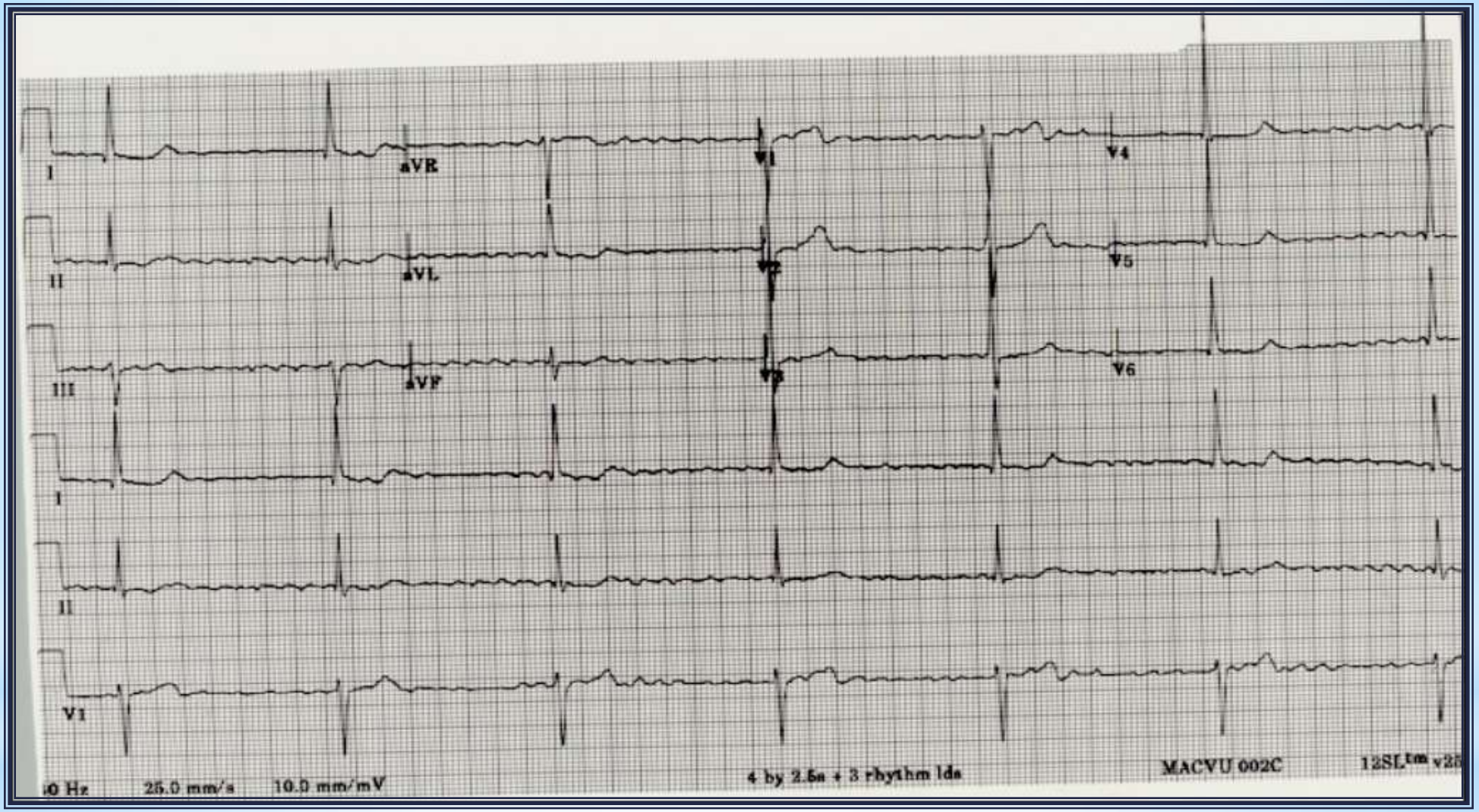

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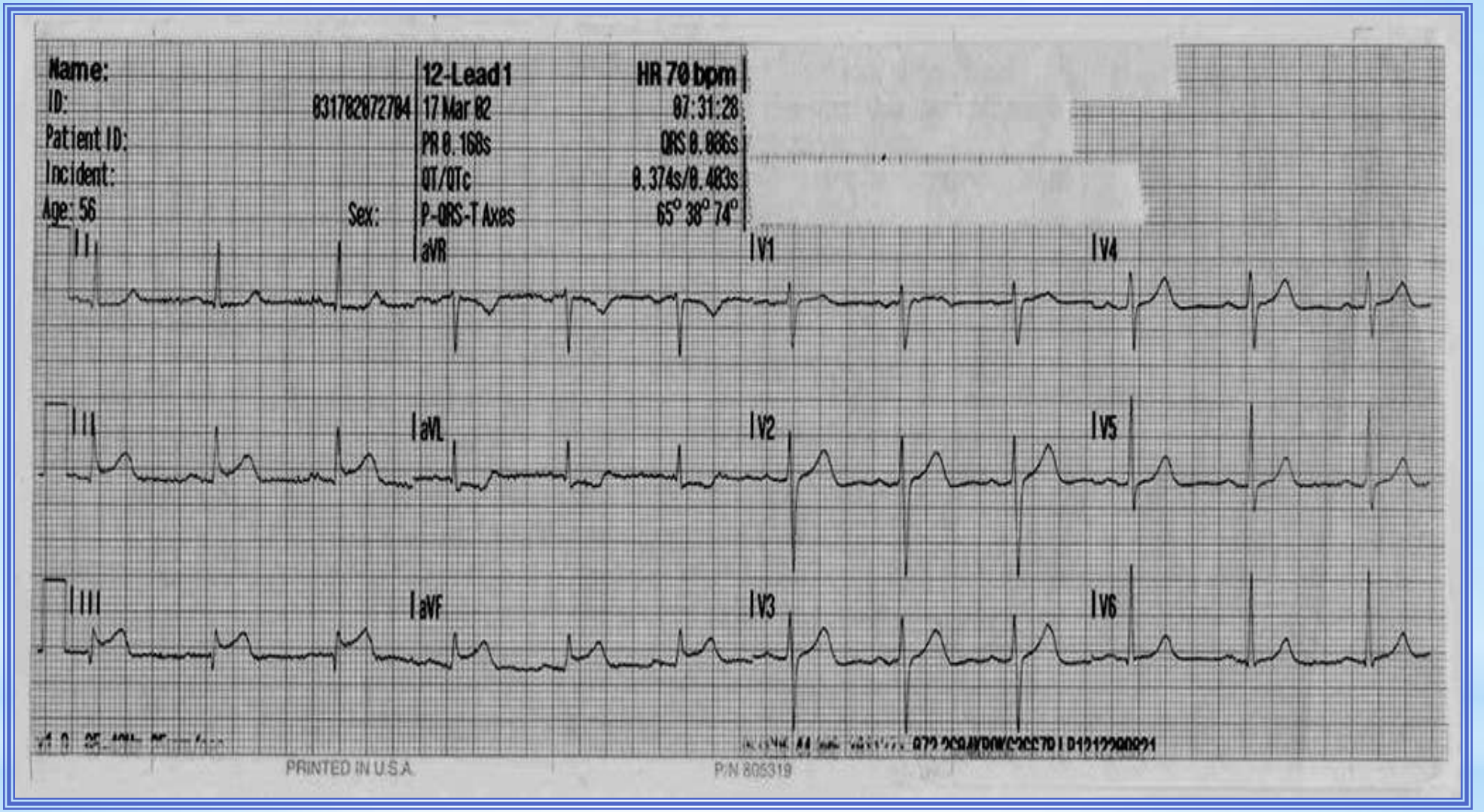

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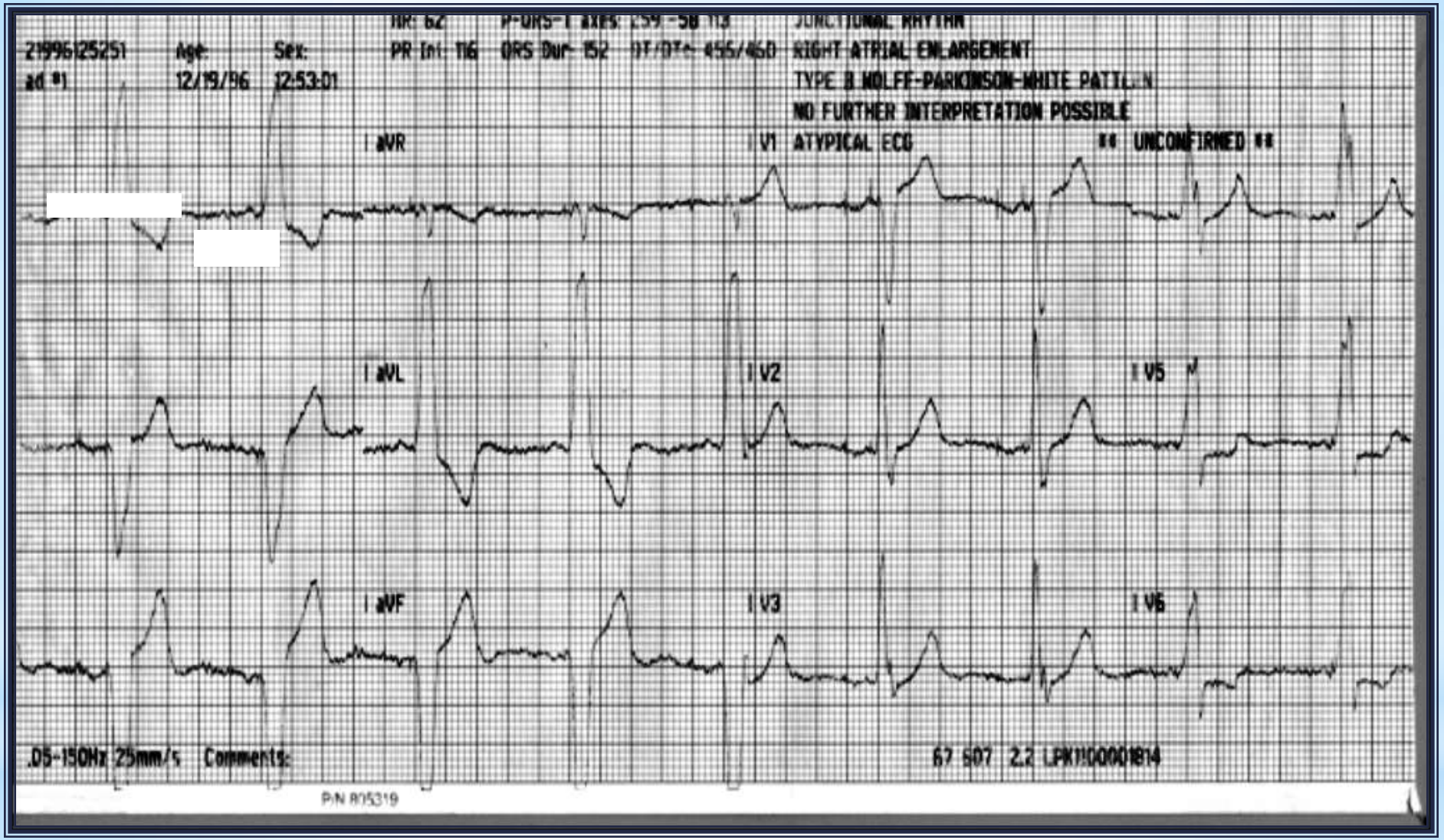

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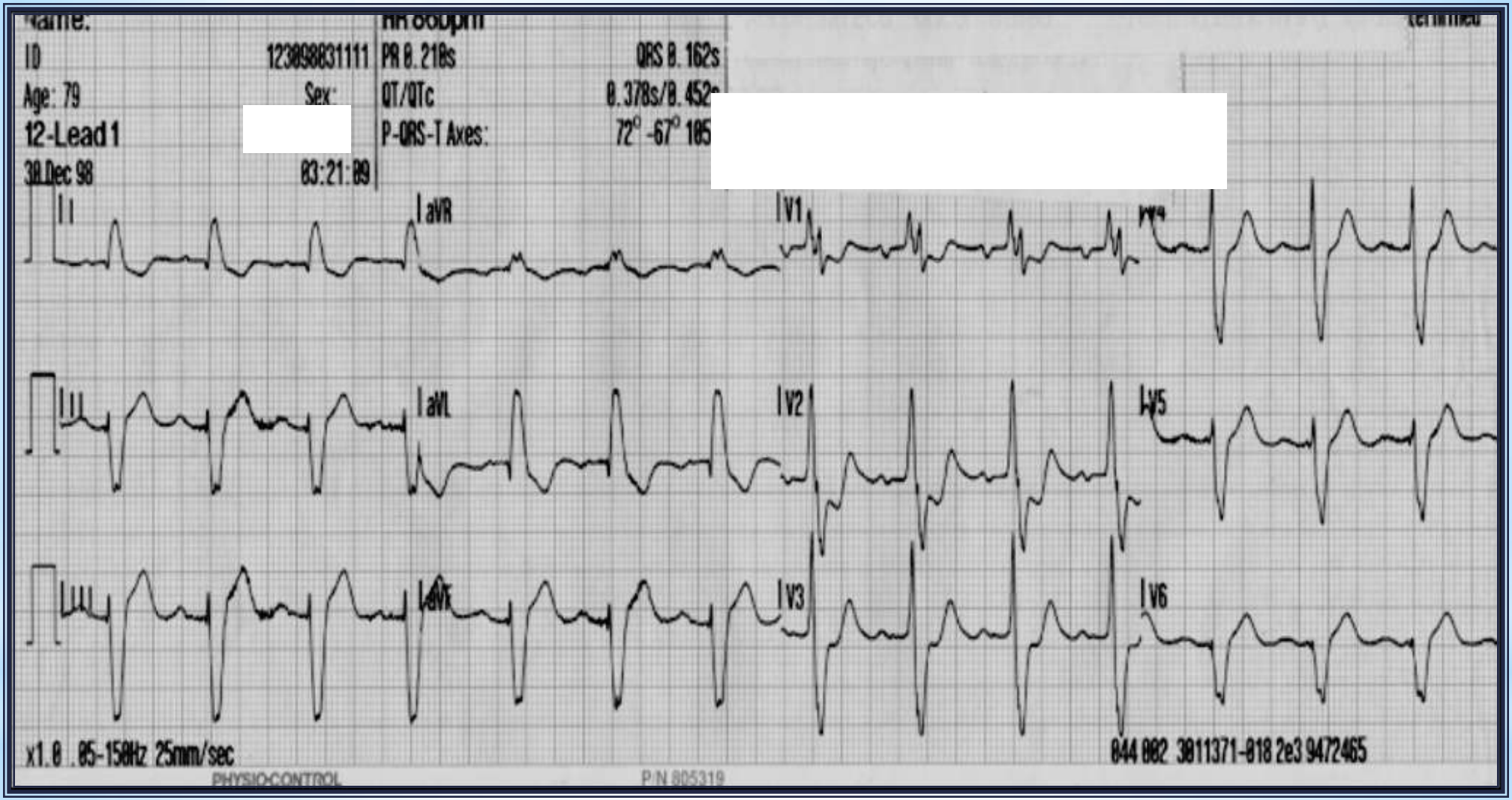
2/15/2012



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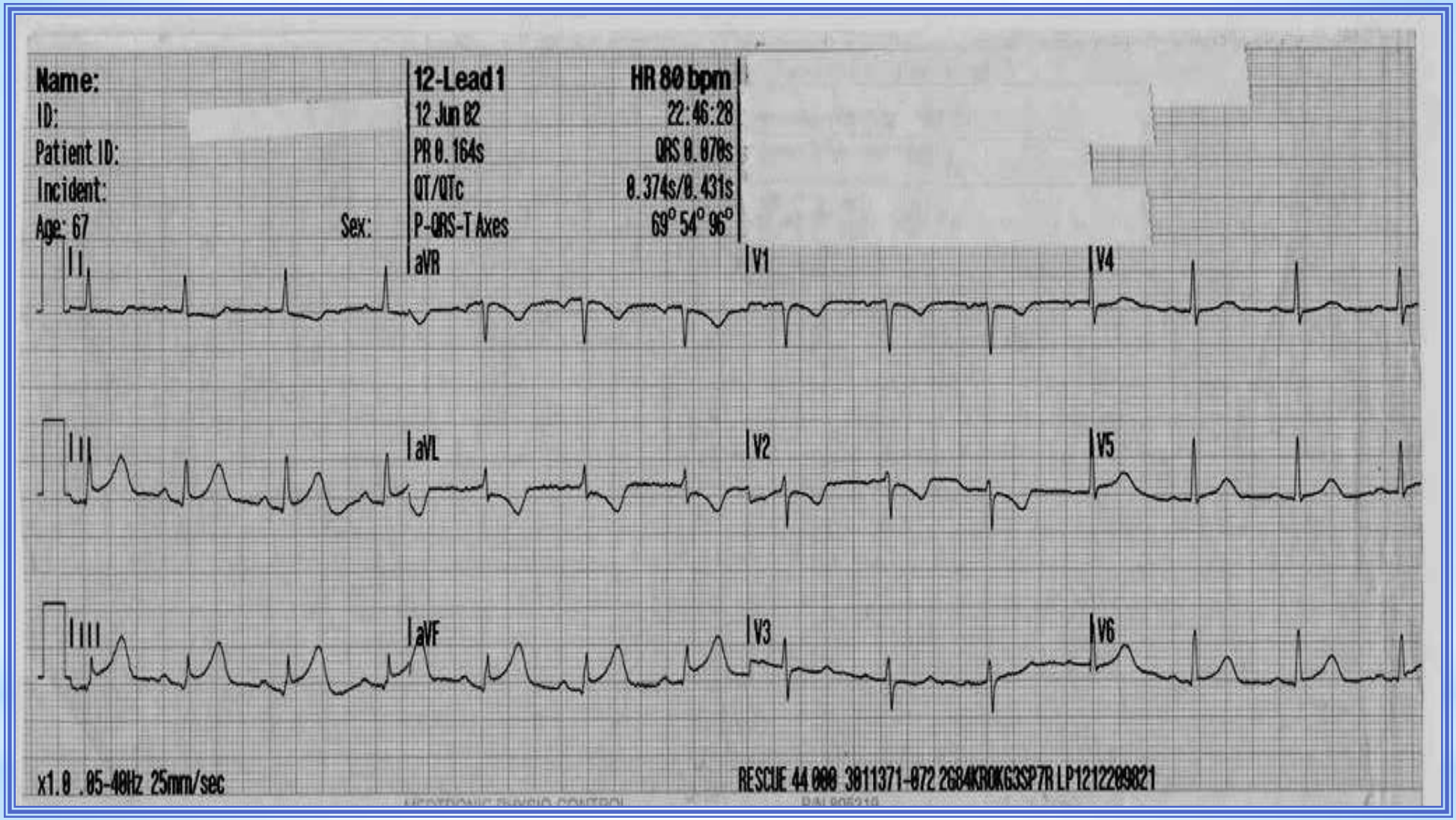
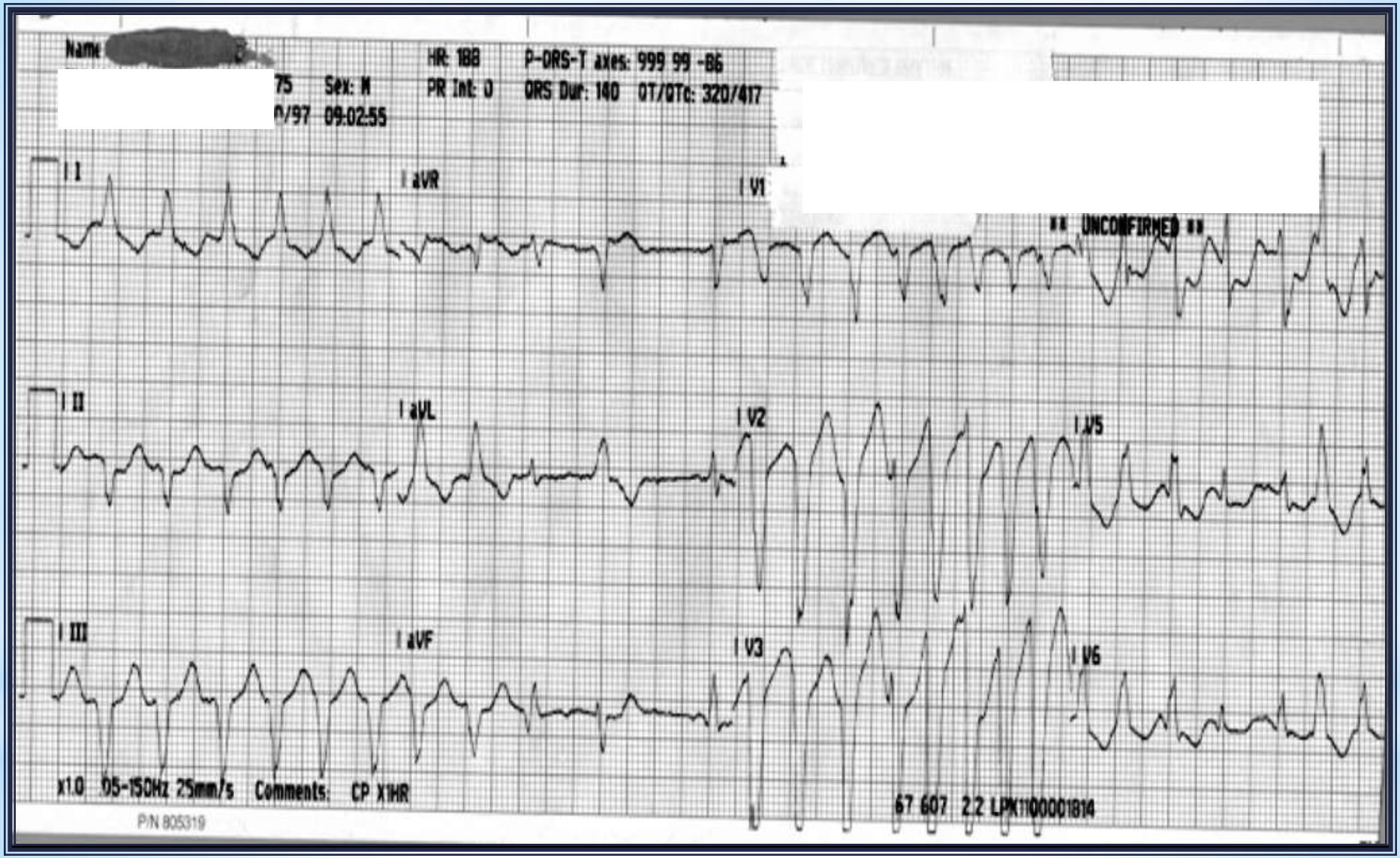


*ECG # 16

2/15/2012



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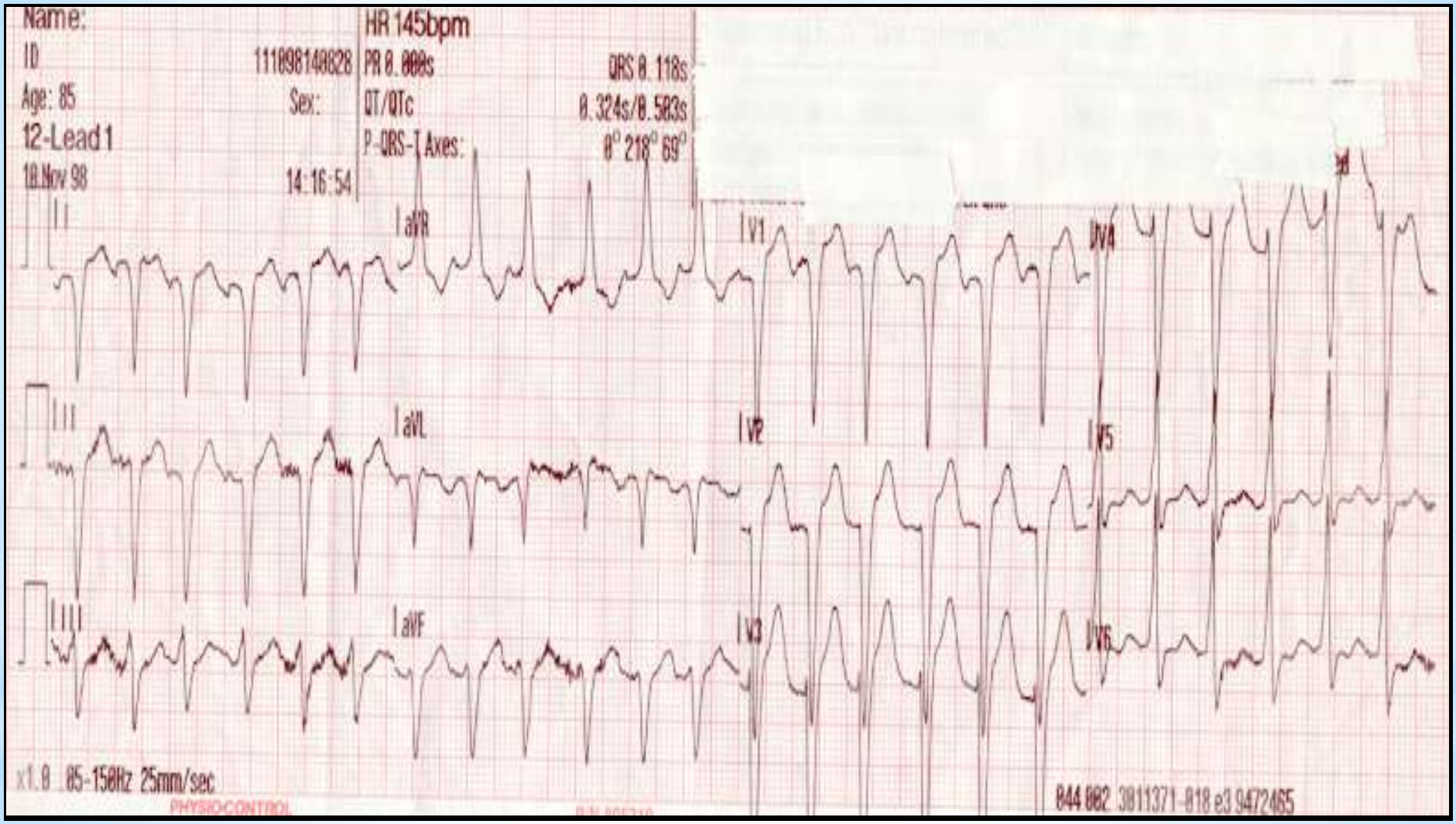
2/15/2012



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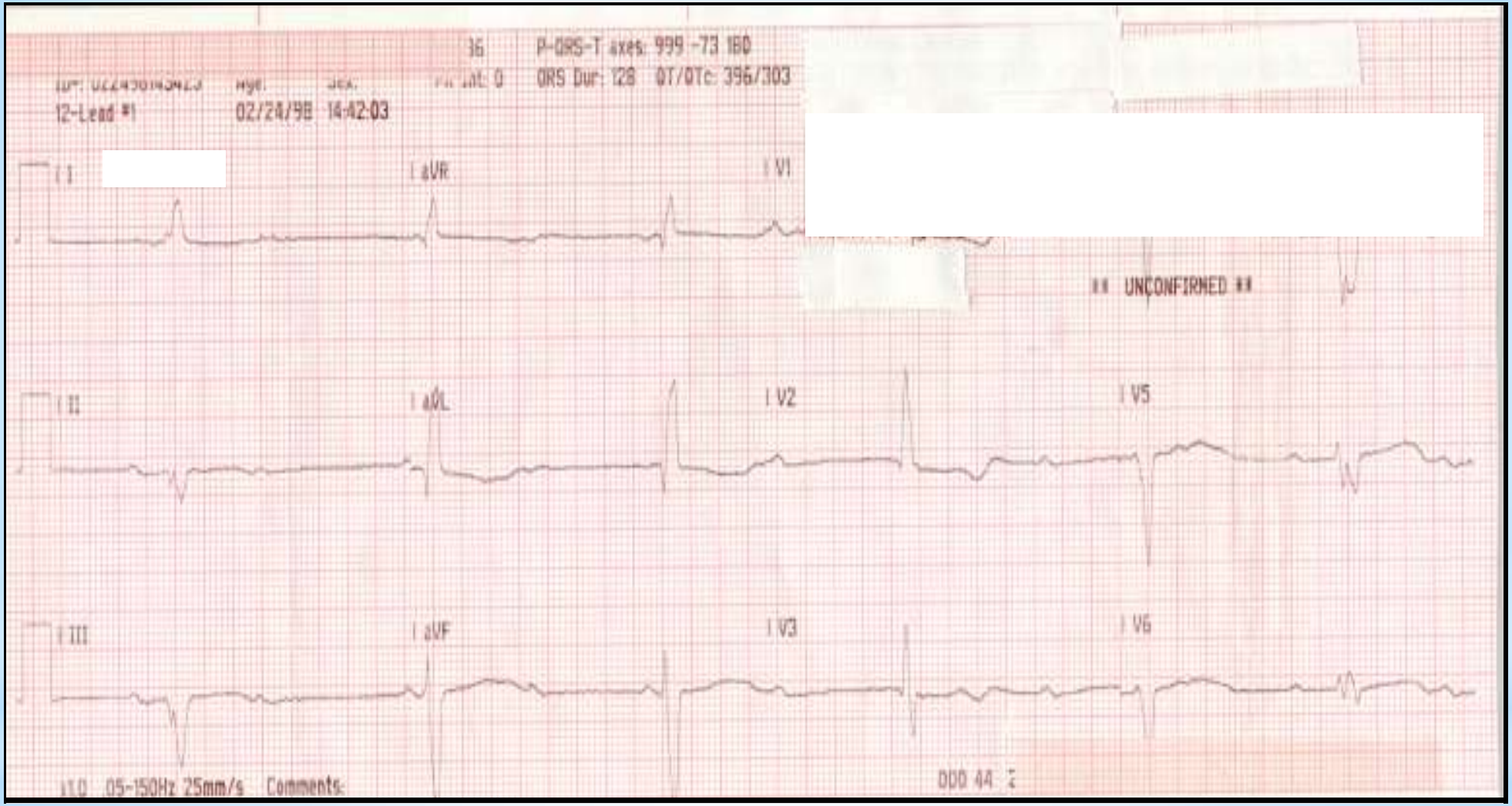

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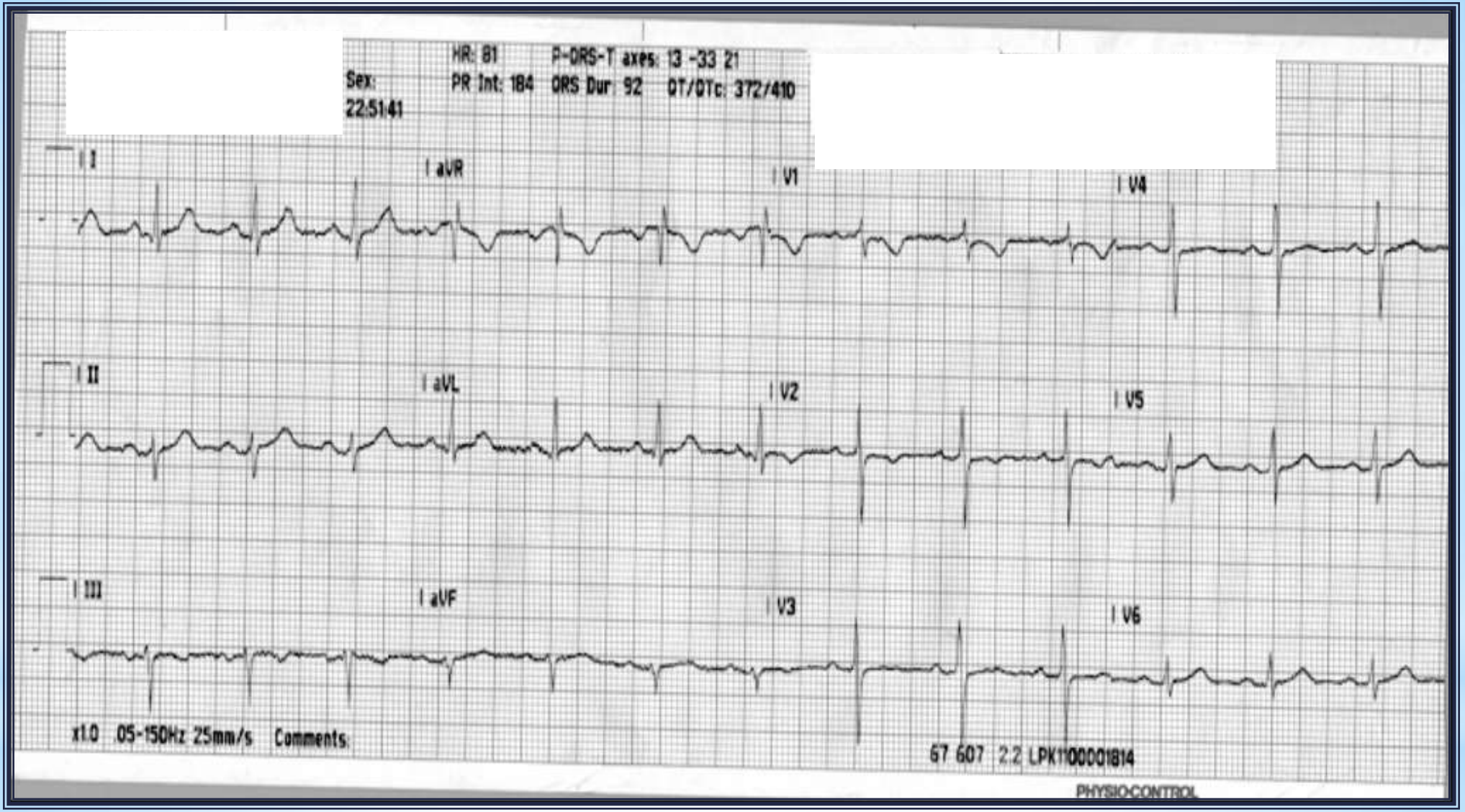
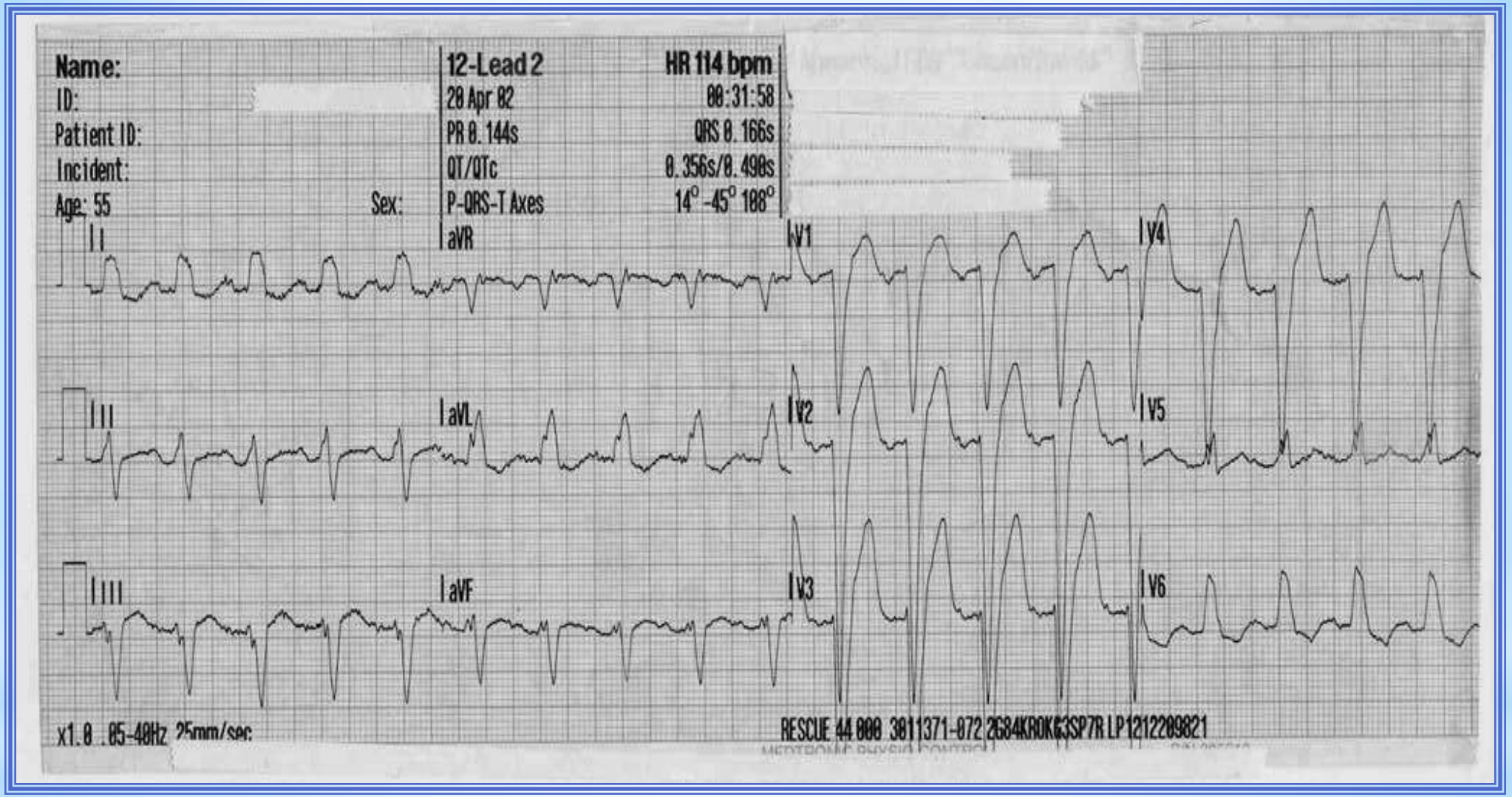


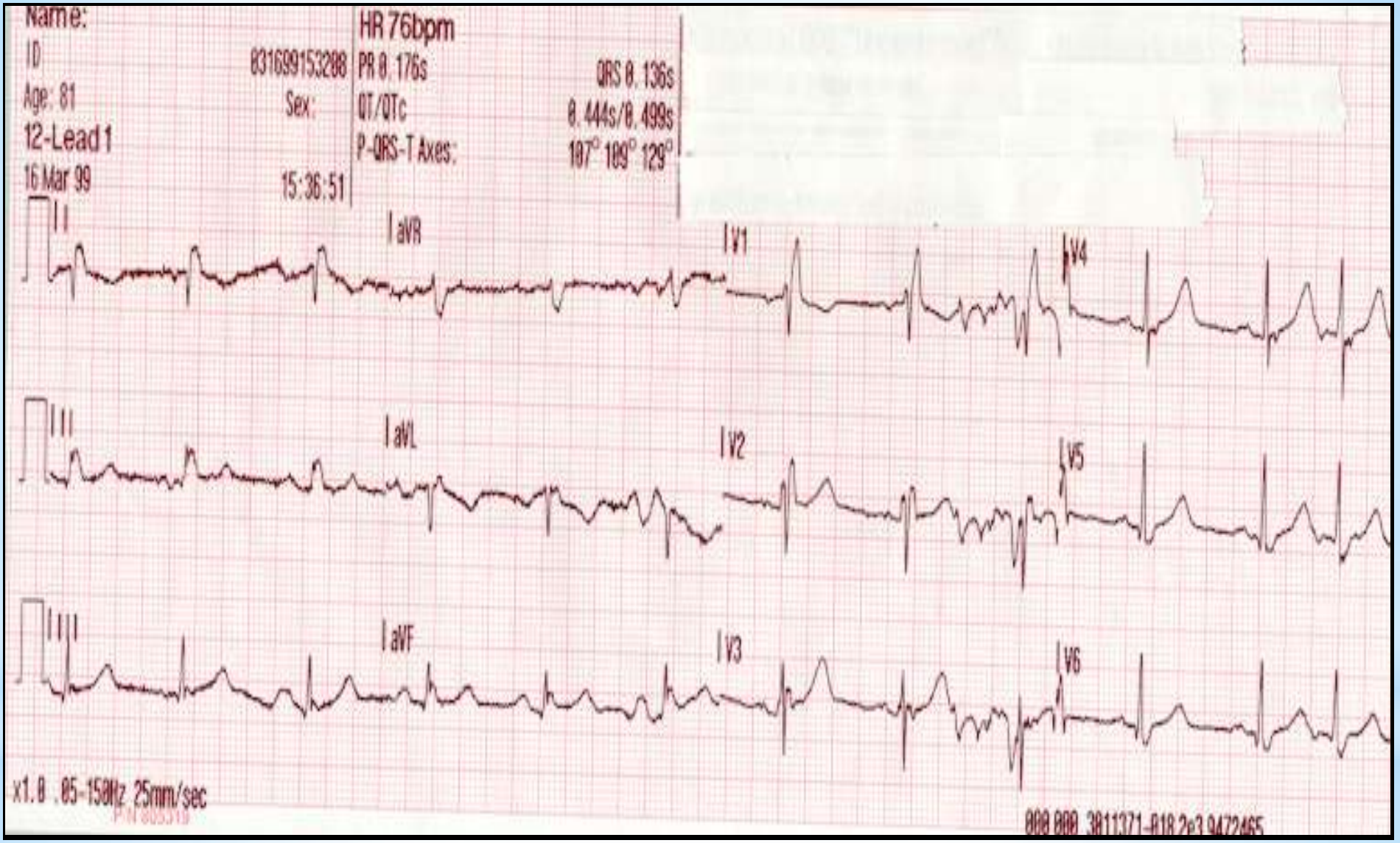
*ECG # 20

2/15/2012



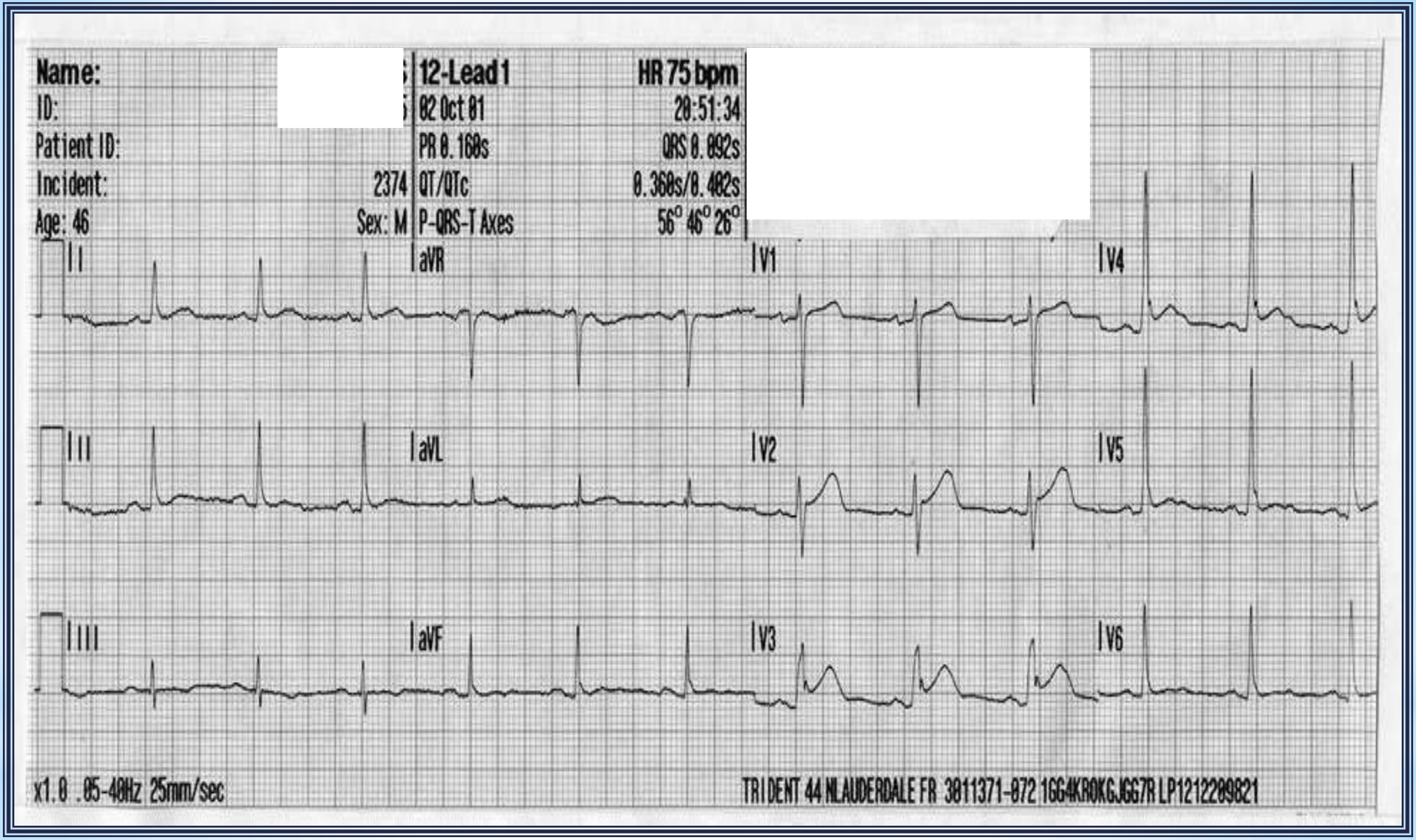
*ECG # 21

2/15/2012



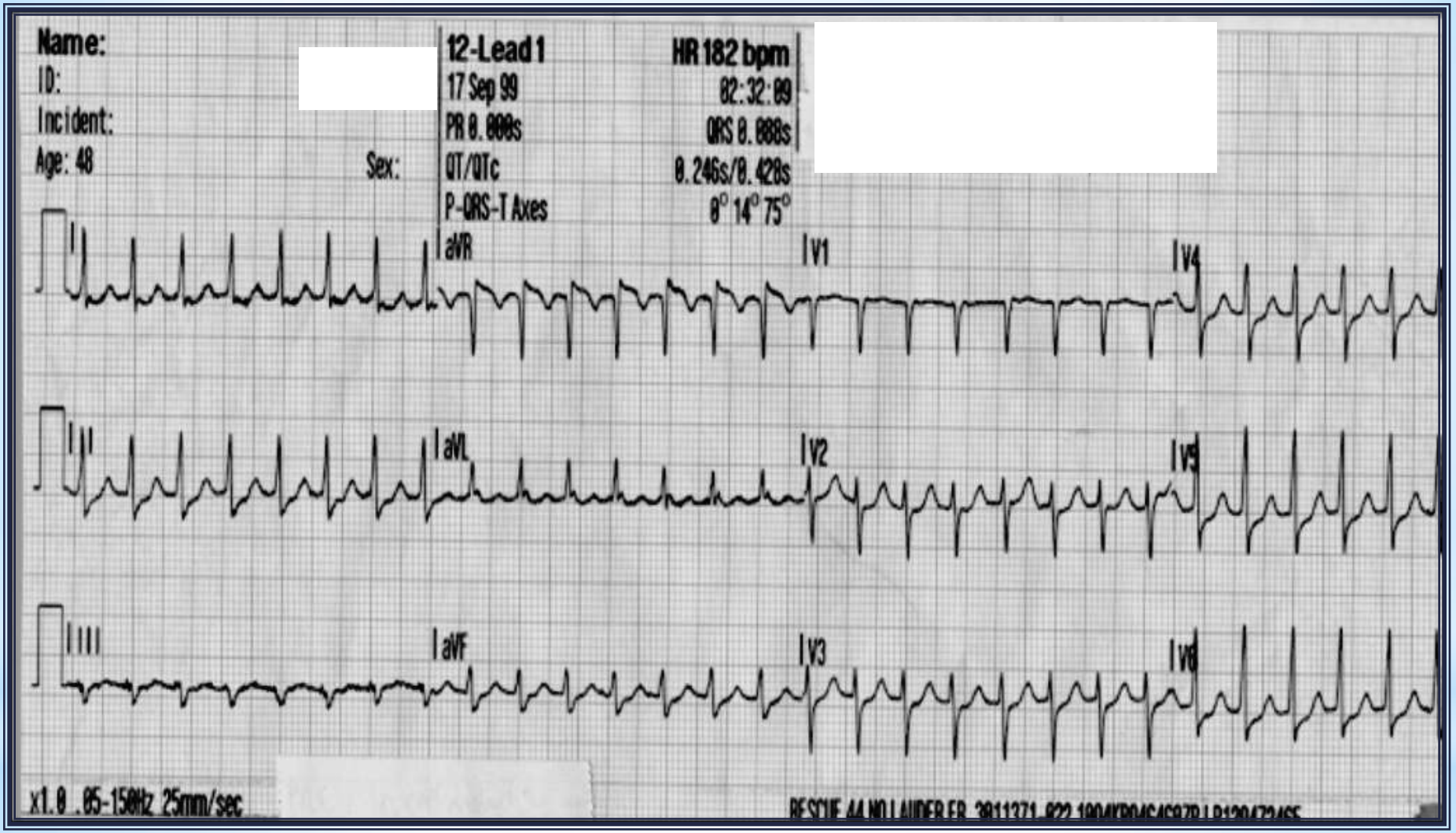
*ECG # 22

2/15/2012



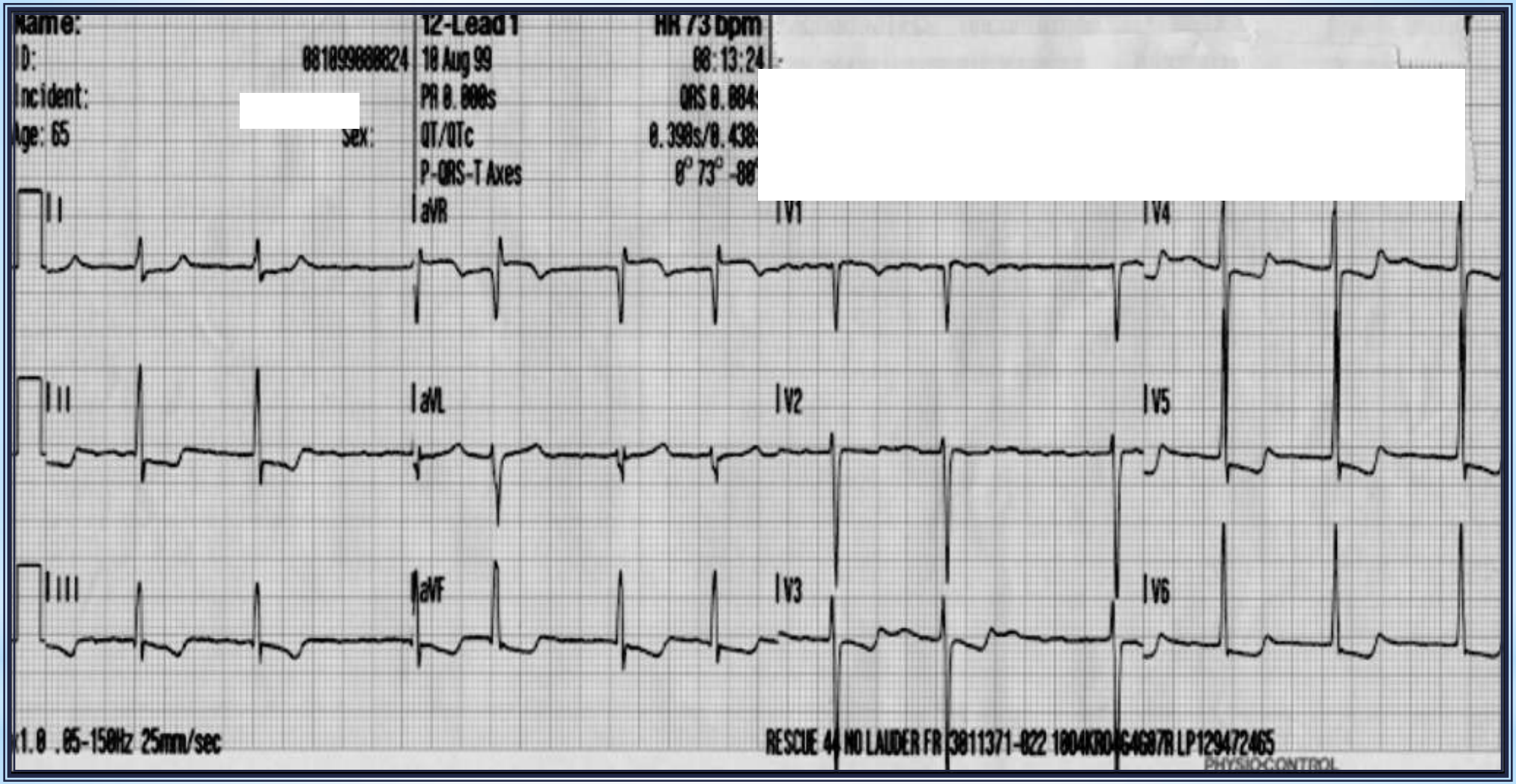
*ECG # 23

2/15/2012



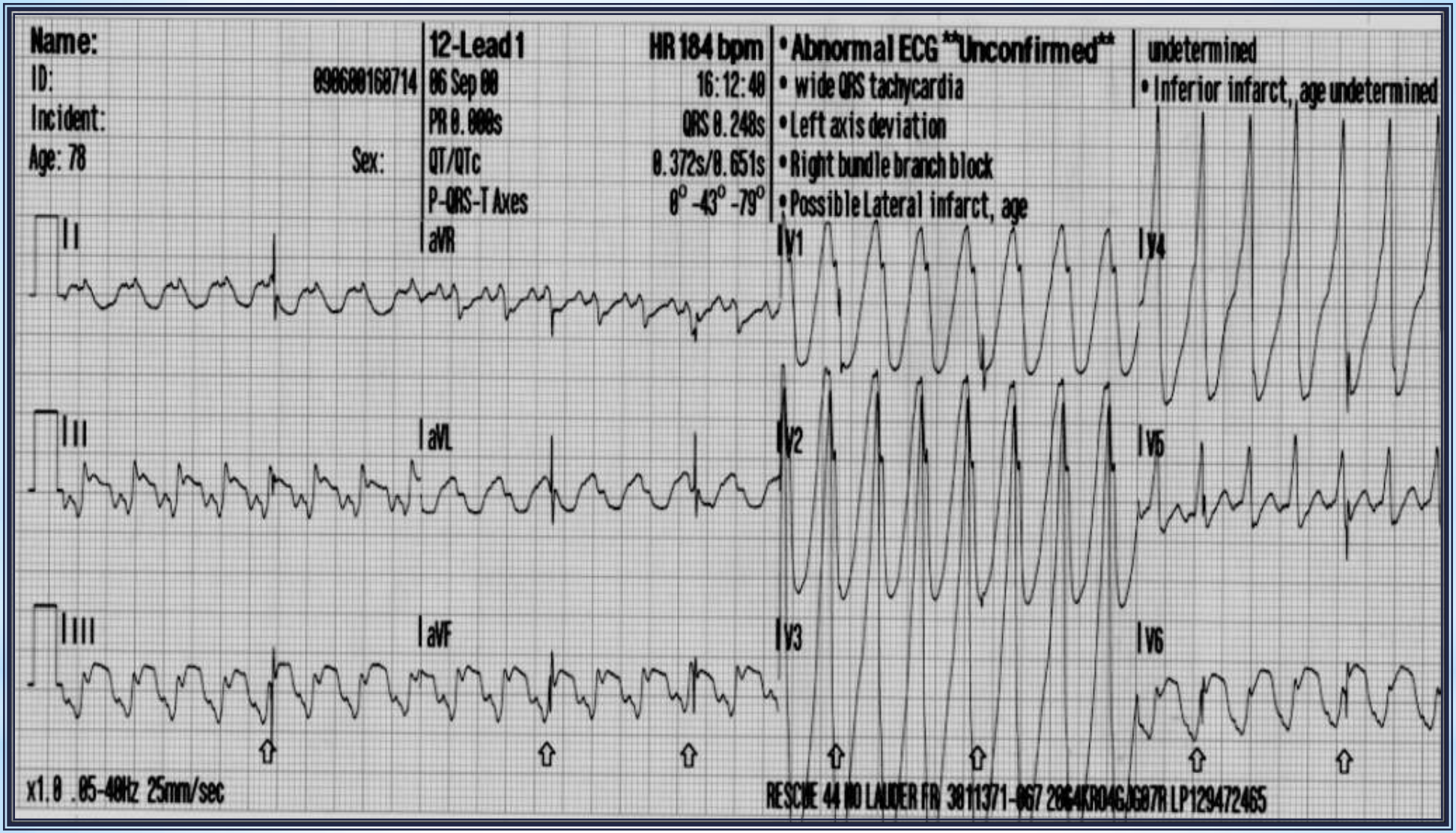
*ECG # 24

2/15/2012



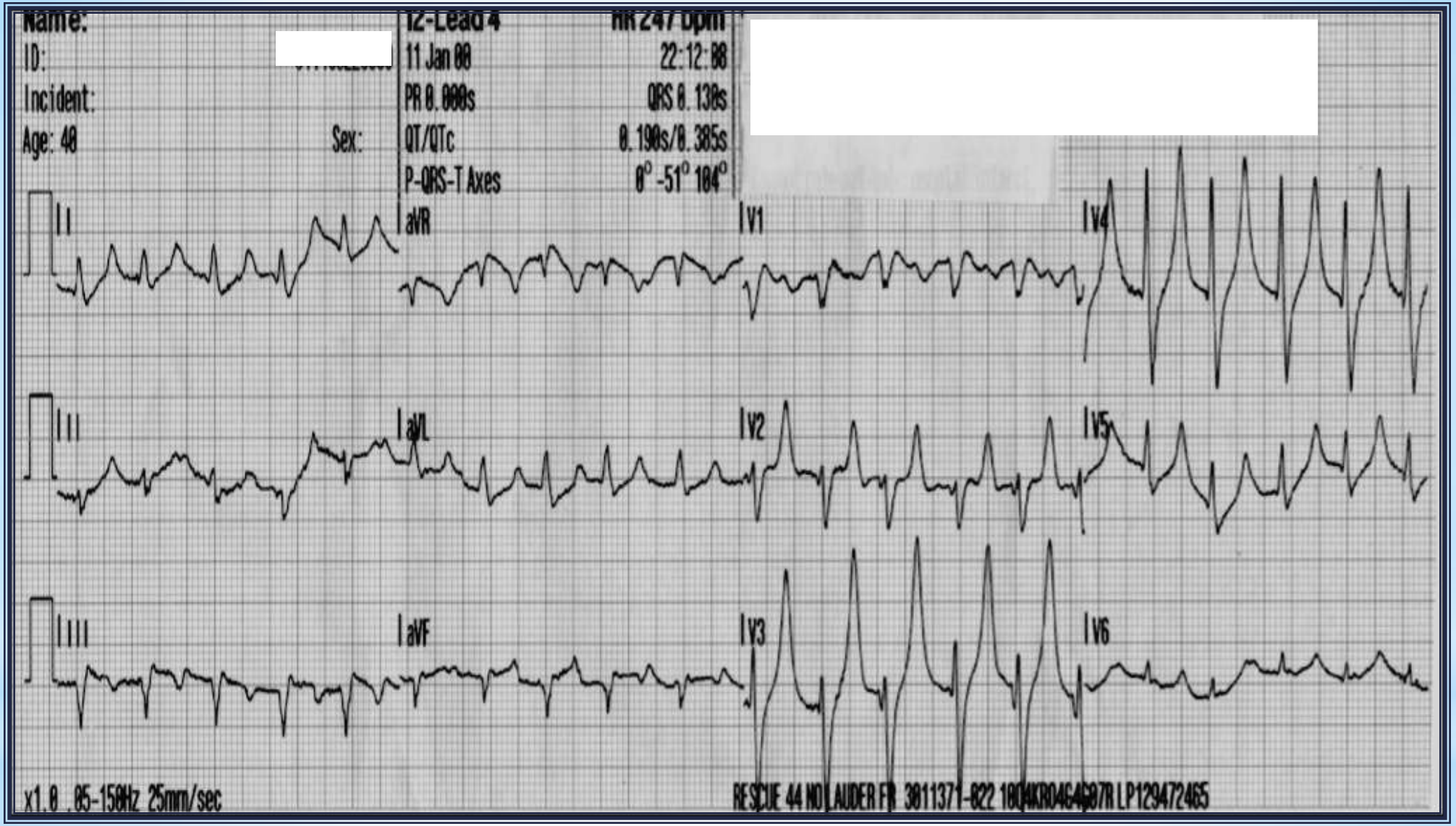
*ECG # 25

2/15/2012



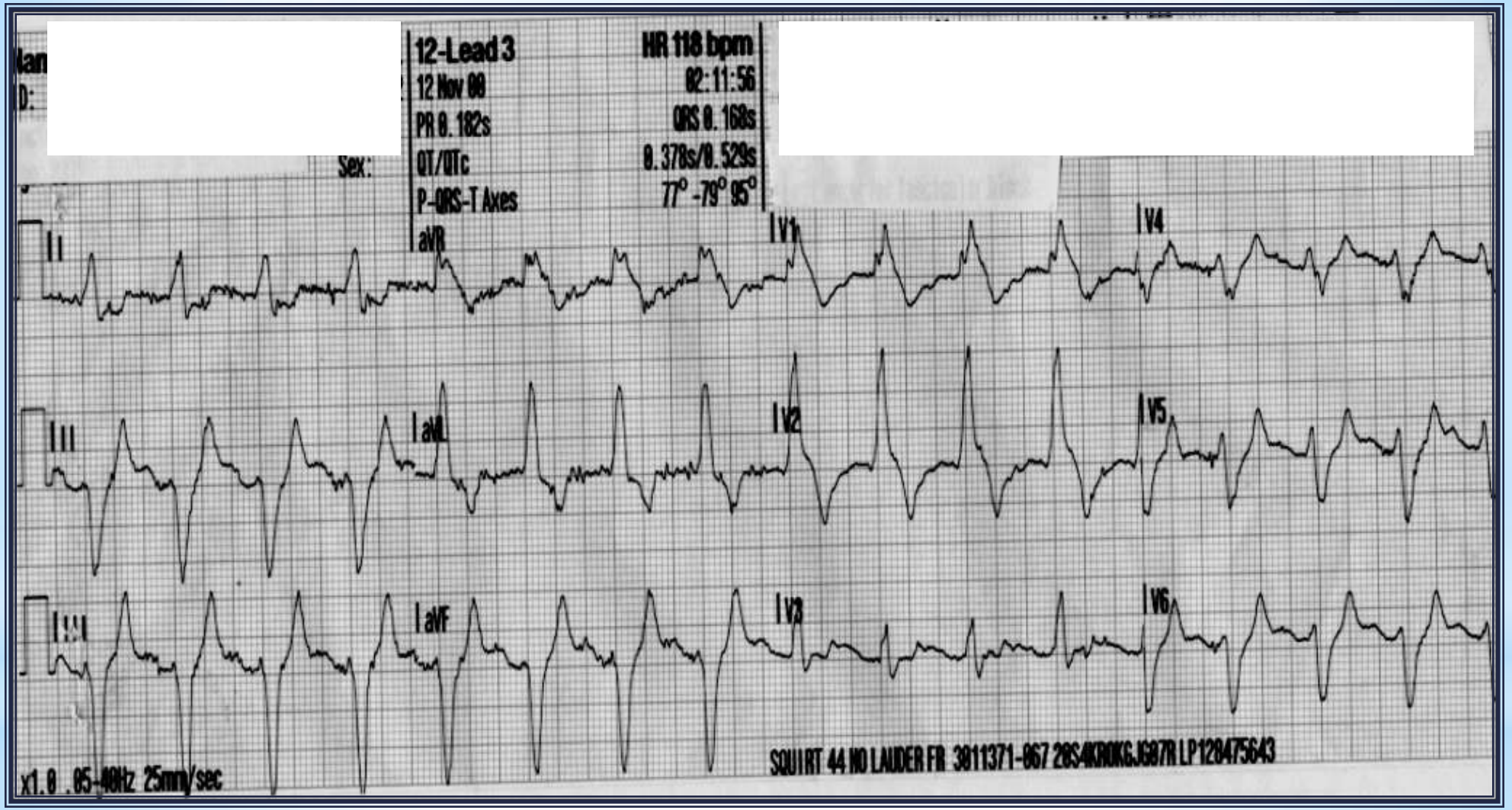
*ECG # 26

2/15/2012



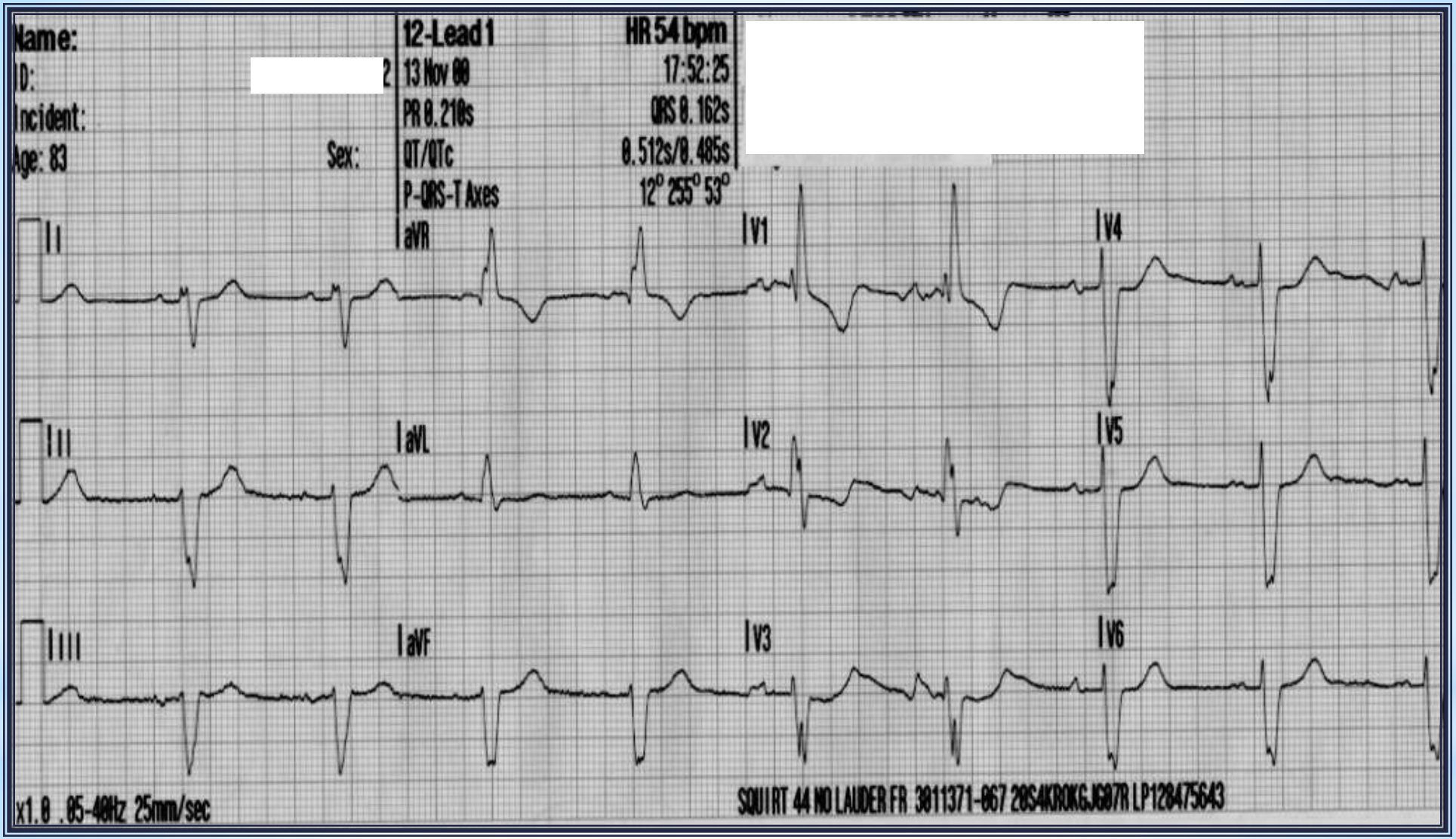
*ECG # 27

2/15/2012



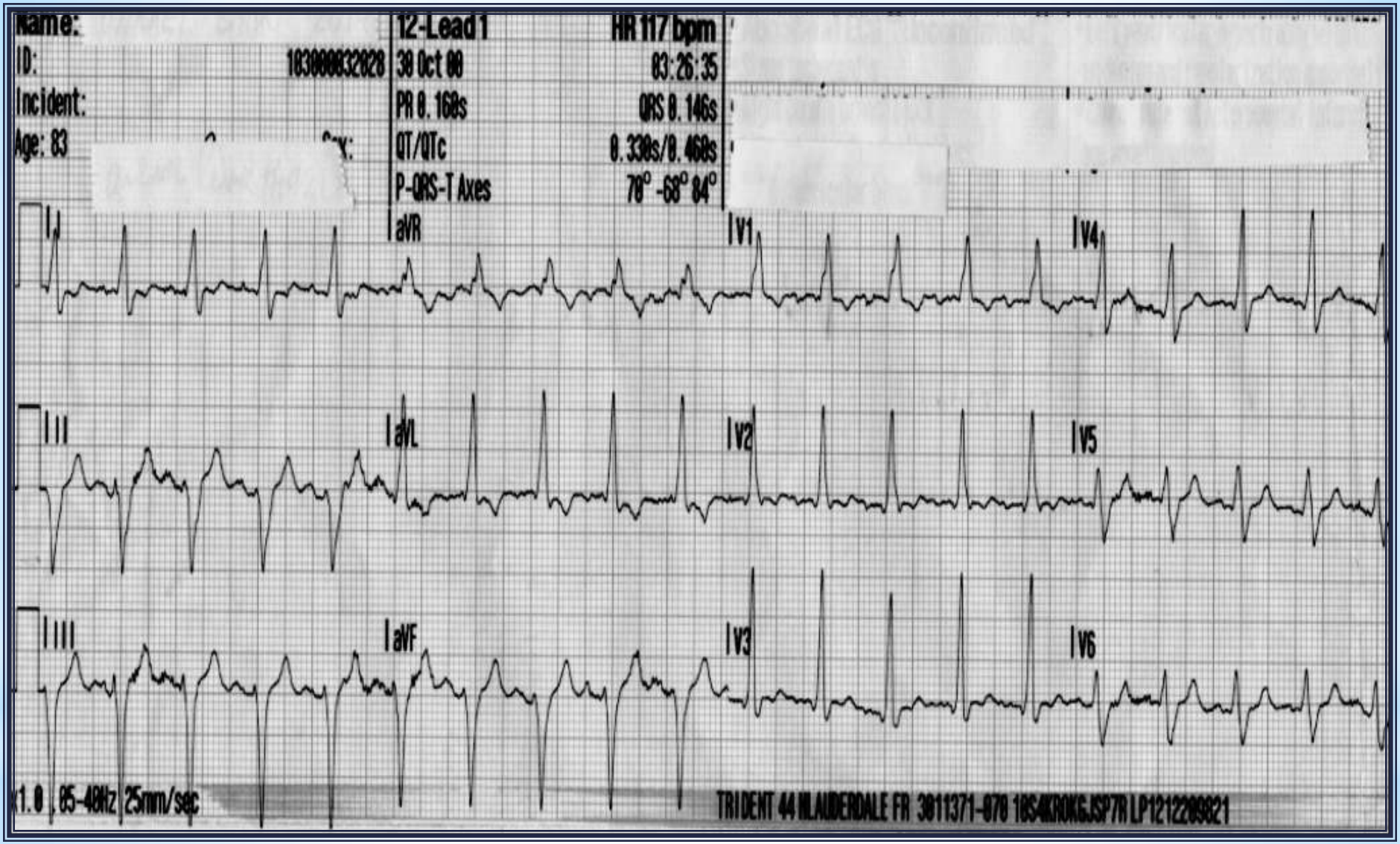
*ECG # 28

2/15/2012



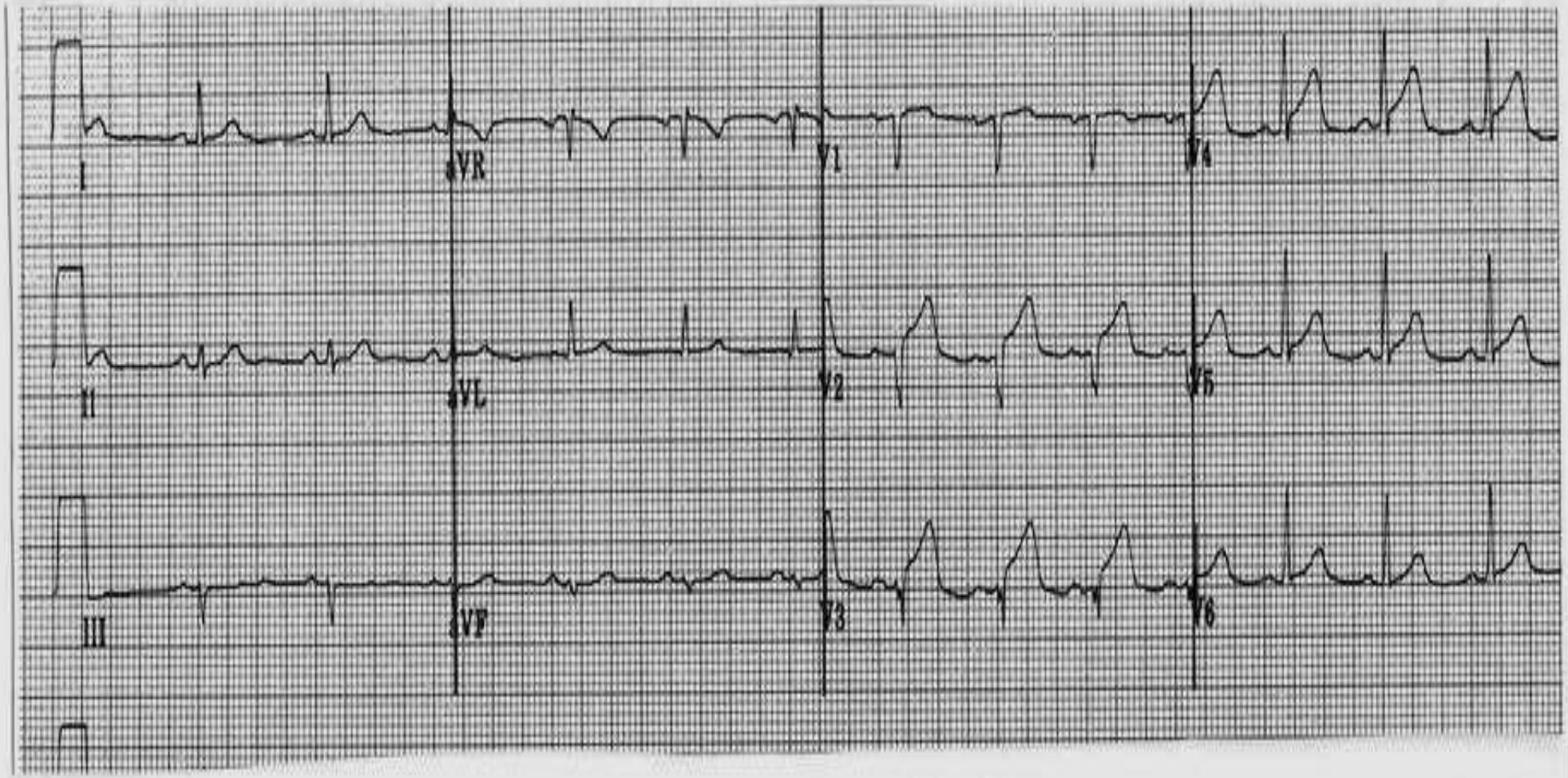
*ECG # 29

2/15/2012



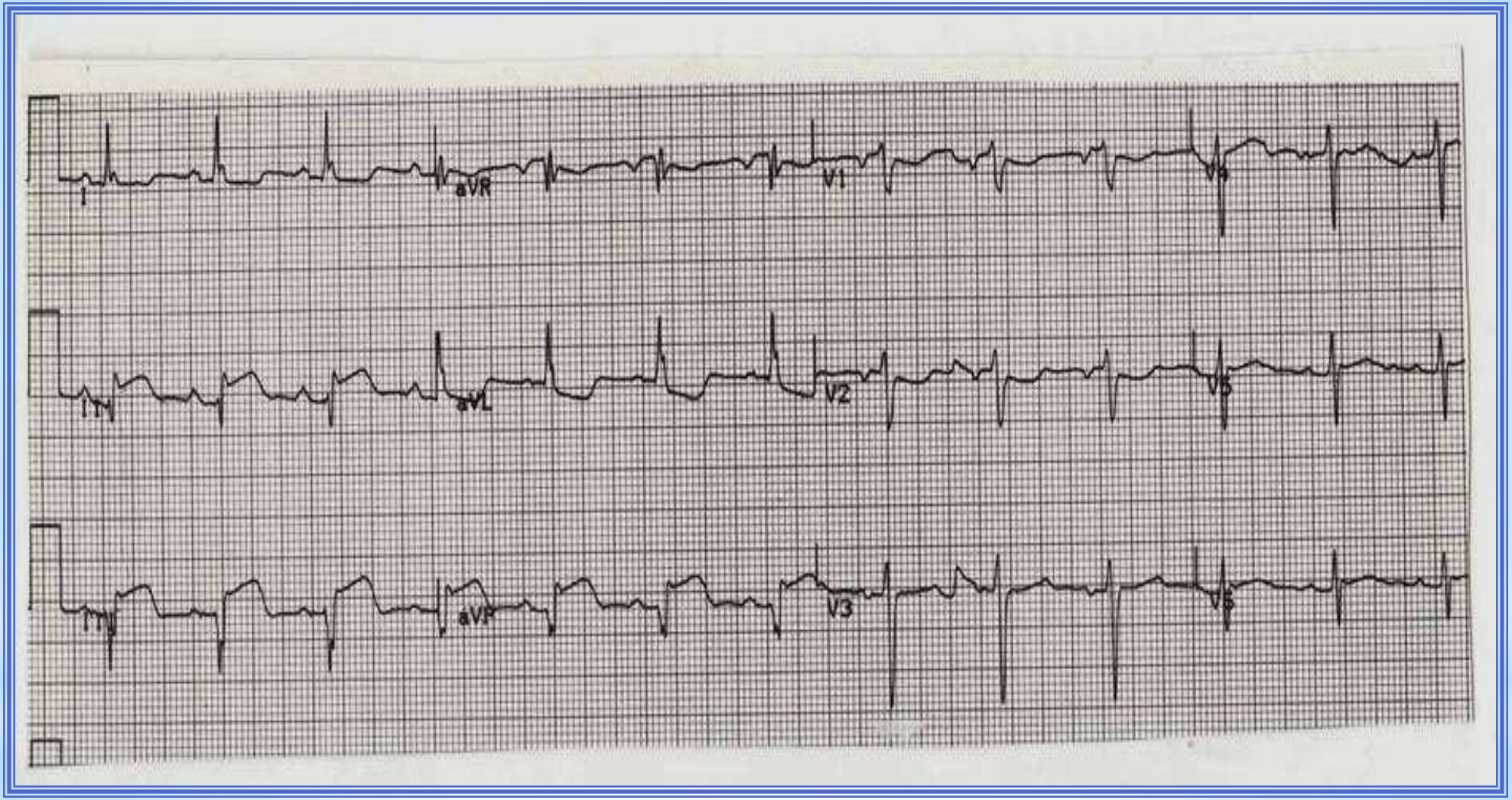
*ECG # 30

2/15/2012



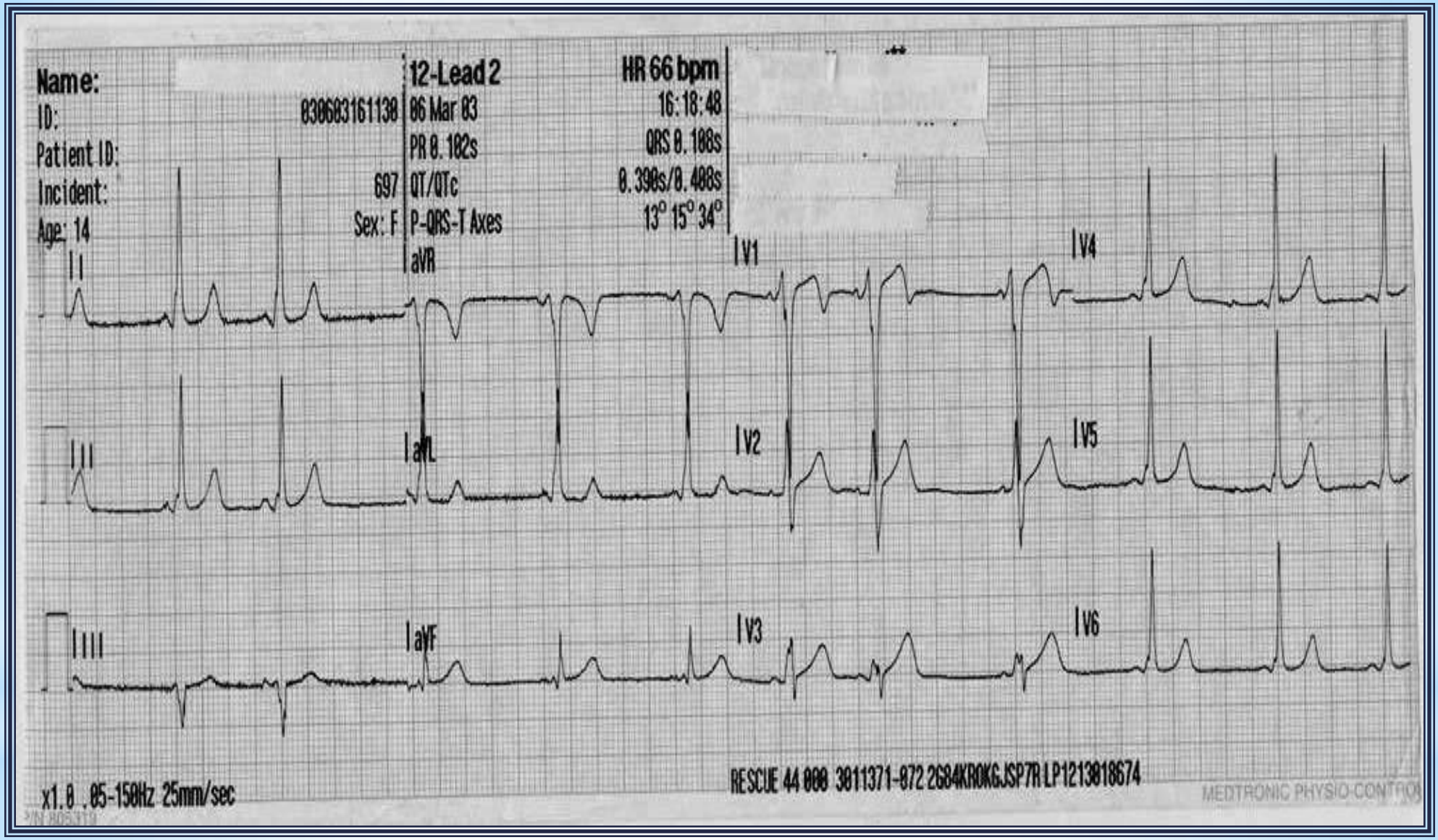
*ECG # 31

2/15/2012



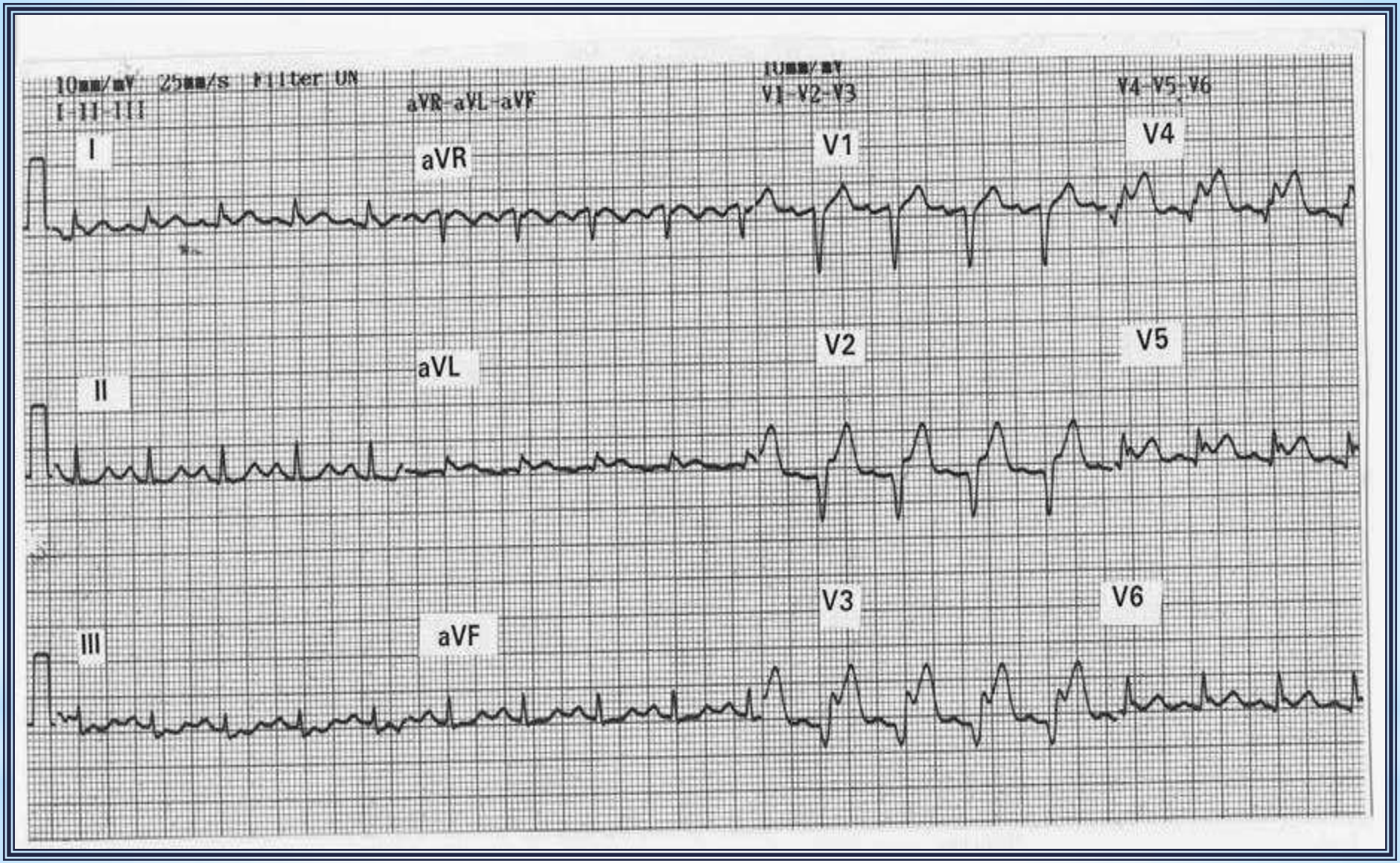
*ECG # 32

2/15/2012



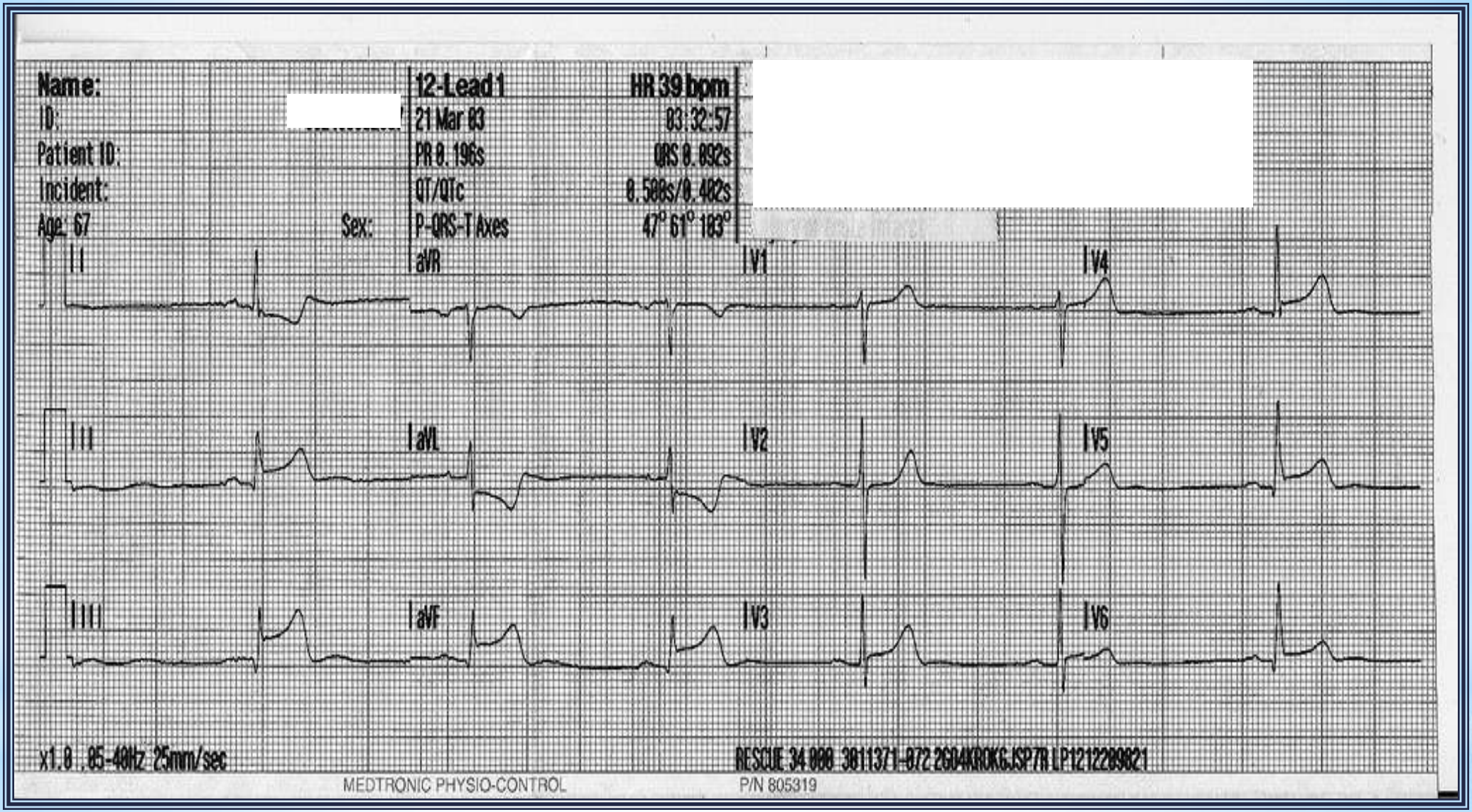
*ECG # 33

2/15/2012



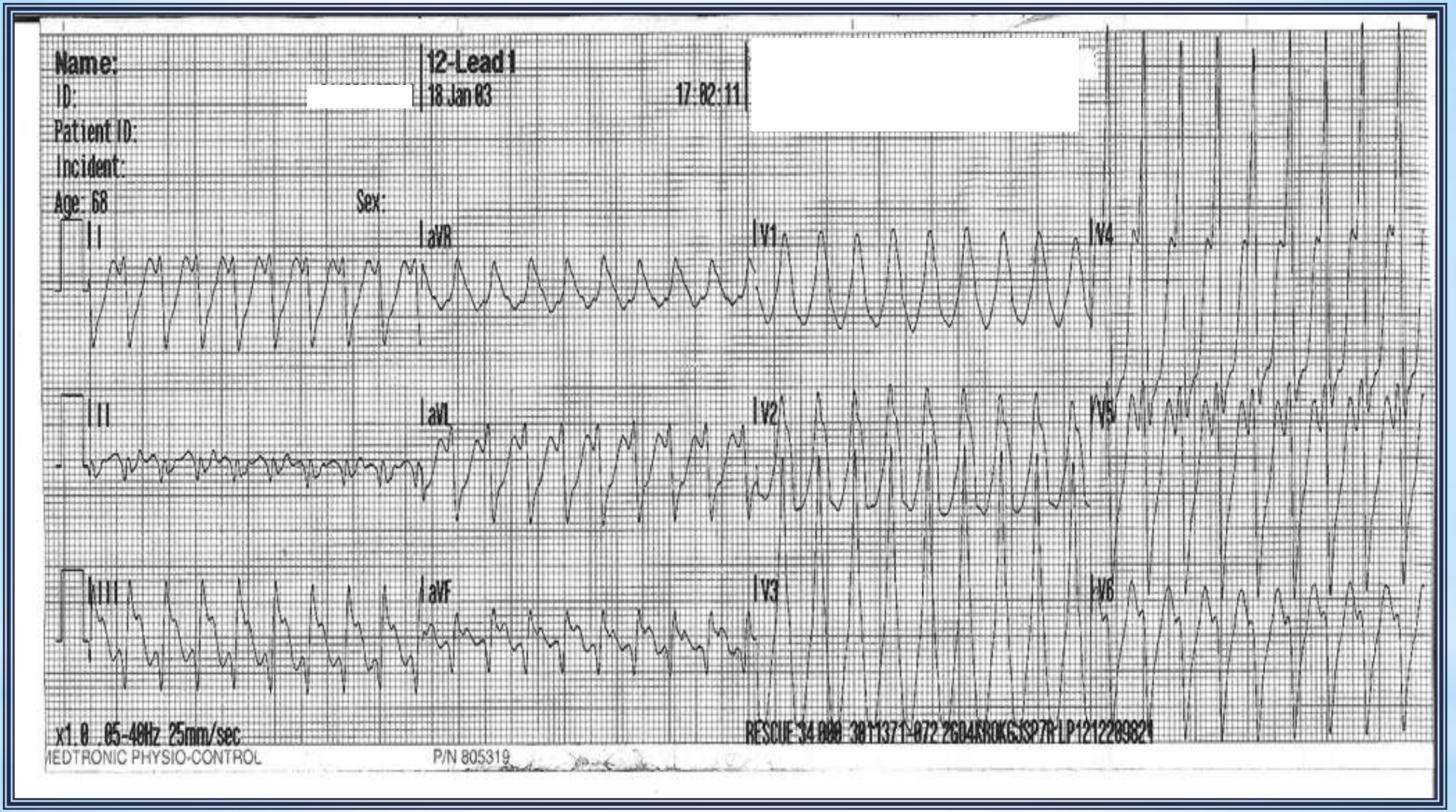
*ECG # 34

2/15/2012



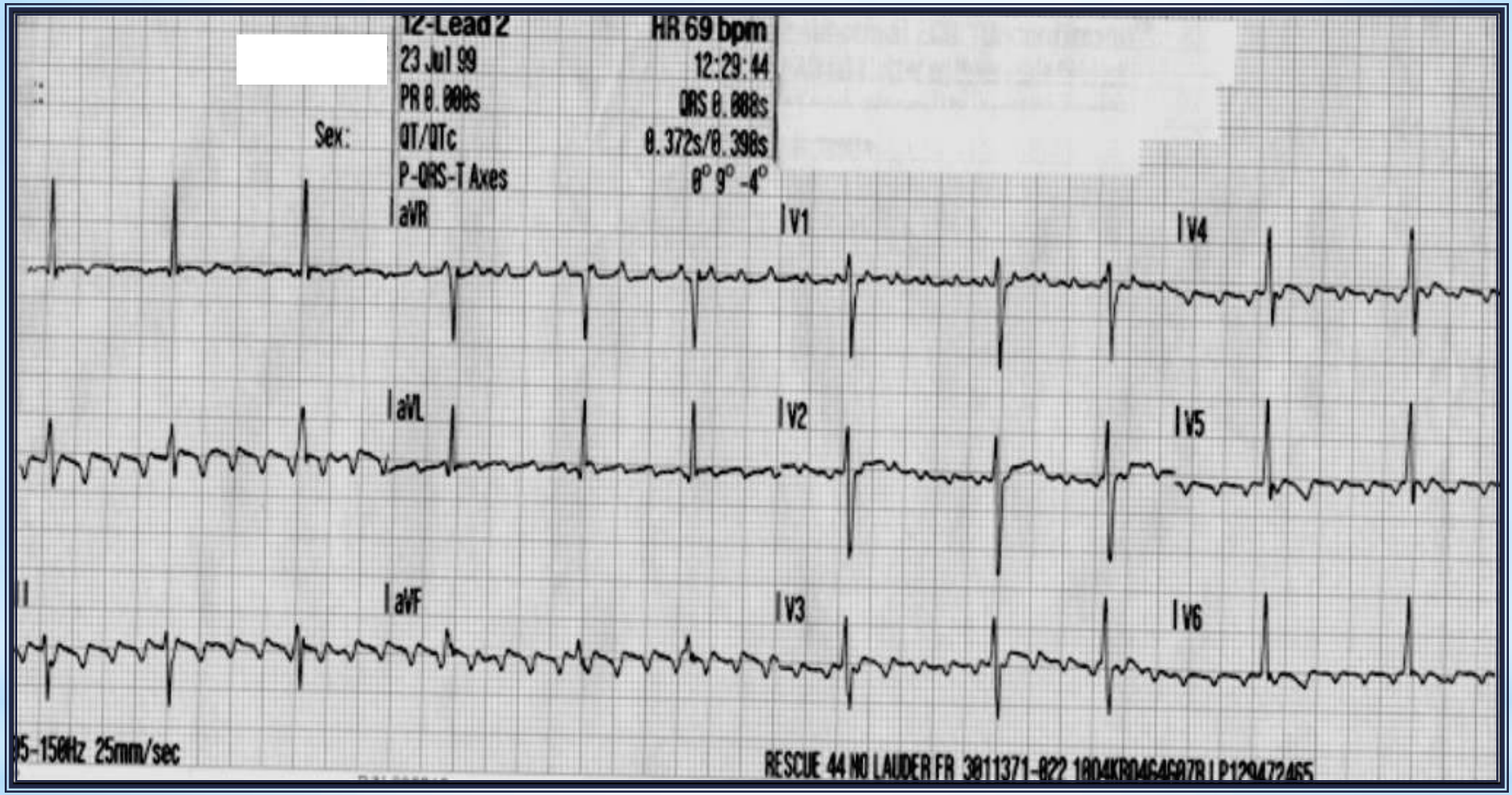
*ECG # 35

2/15/2012



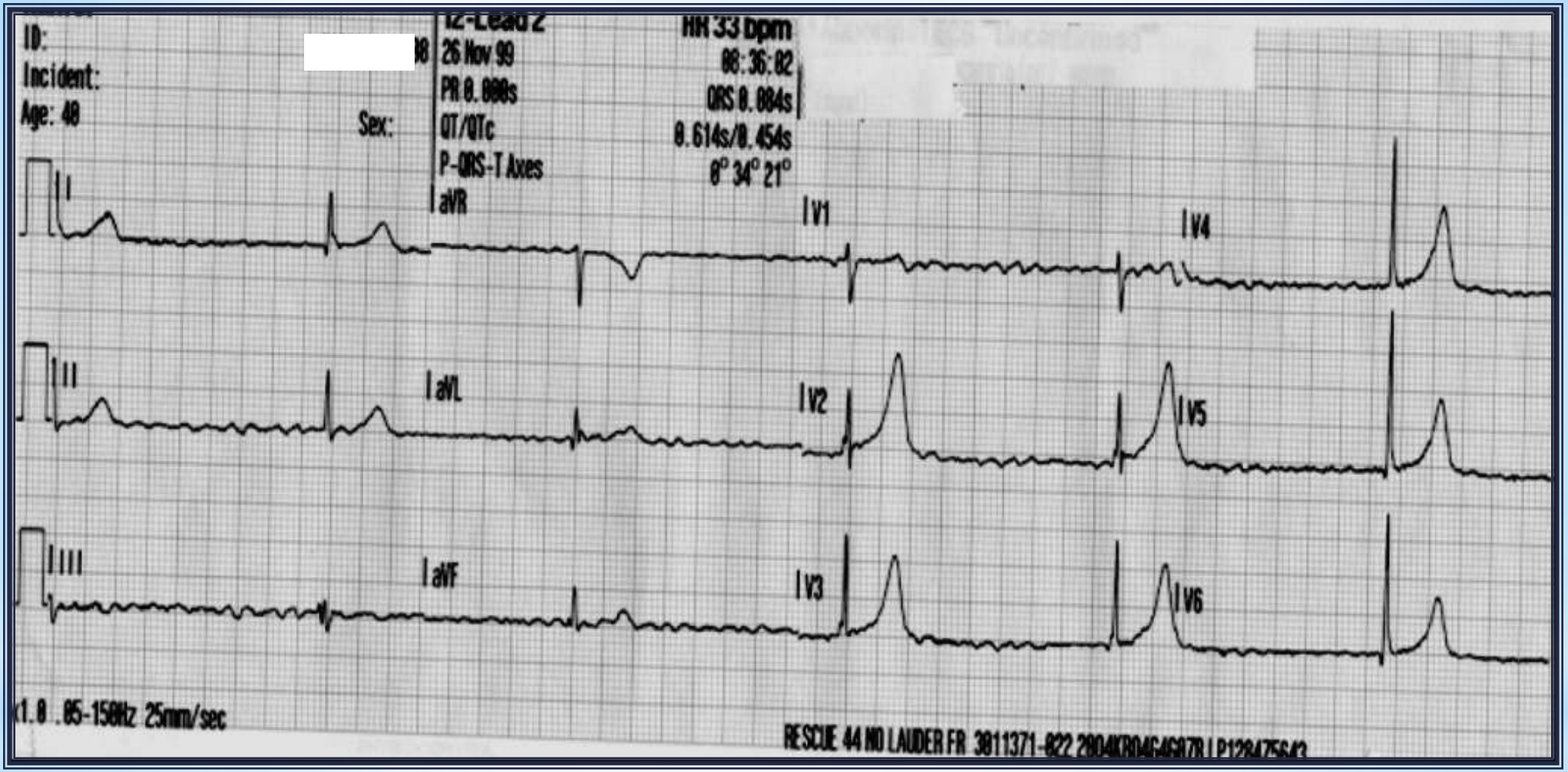
*ECG # 36

2/15/2012



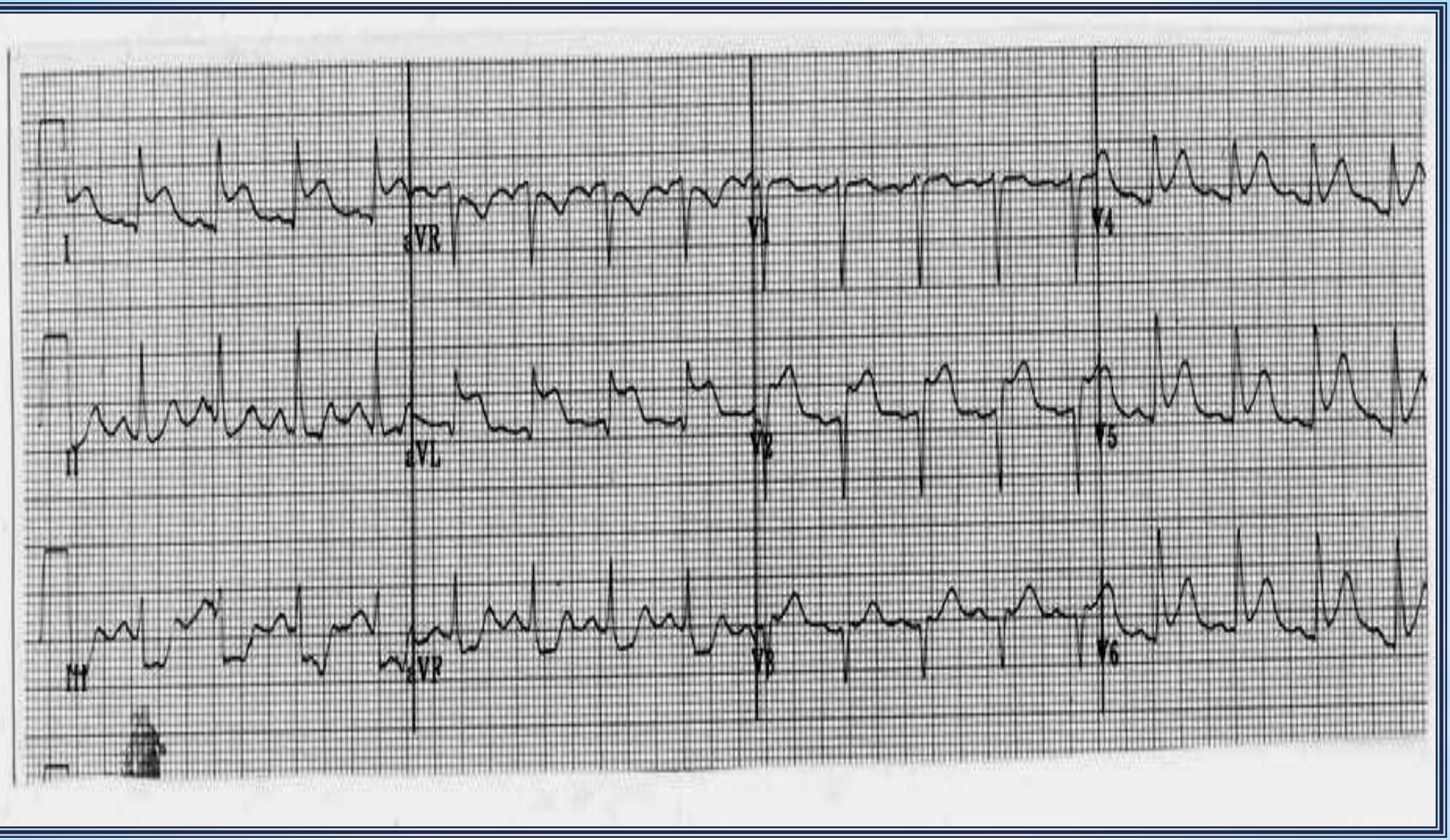
*ECG # 37

2/15/2012



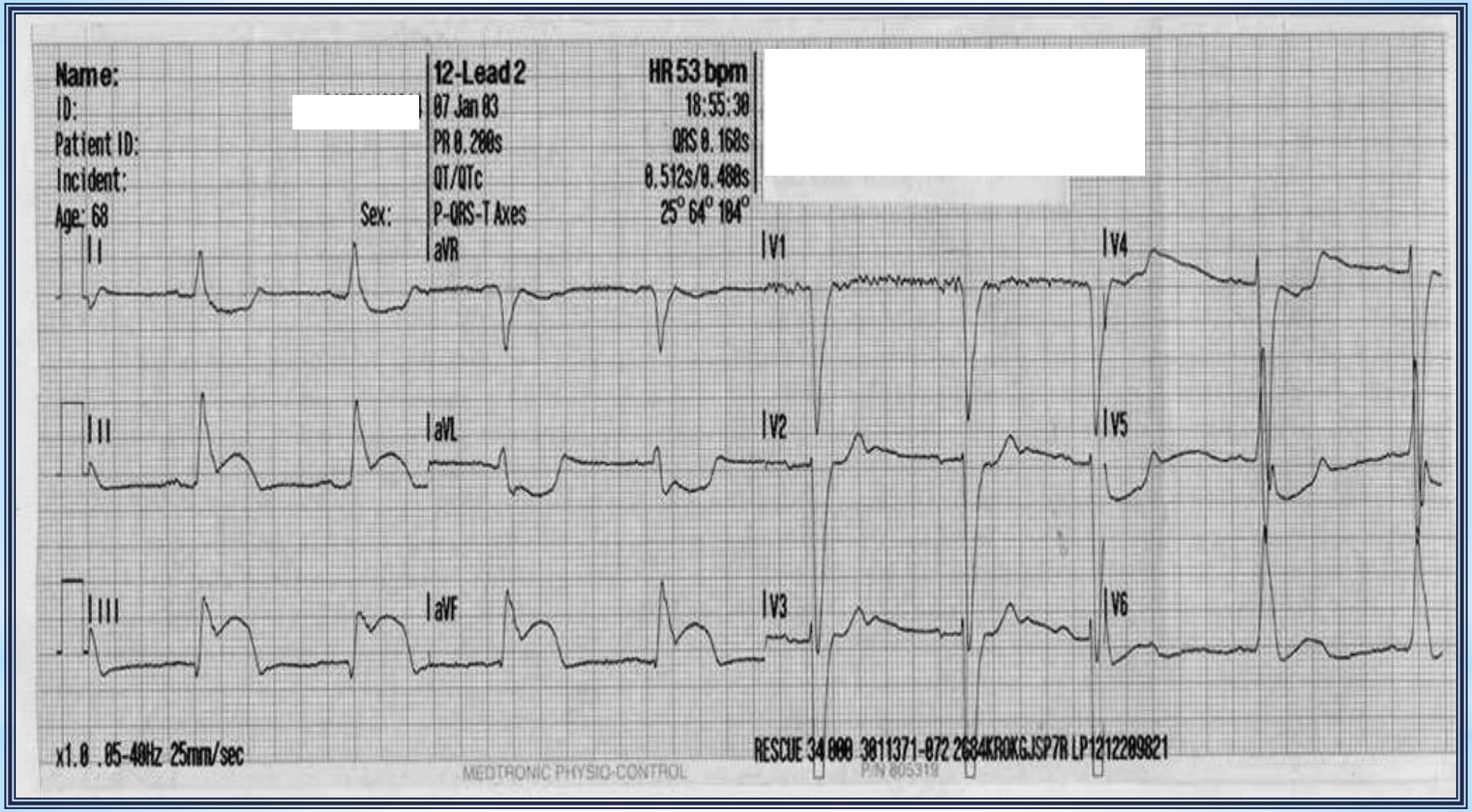
*ECG # 38

2/15/2012



*ECG # 39

2/15/2012



*ECG # 40

2/15/2012