Bayfront Health
Seven Rivers

BASIC ECG PRINCIPLES

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www.ECGtraining.org
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Download Initial Stabilization of the Atrial Fib Patient - SCPC 19th Congress

Download QTc Monitoring Policy for Patients on QT Prolonging Meds

Download A-Fib / Flutter ER Physician's Order Set - BHDC

Download A-Fib / Flutter Flowchart Emerg Care BHDC

Download Team Driven Performance Improvement - SCPC 19th Congress

Download TDPI in Ambulance Industry Journal

Download TJC Sentinel Event Alert - Disruptive Physicians

Download ACLS 2015 Algorithm Cheat Sheets

Download 2015 ACLS Algorithms with ECG examples

Download Neighbors Saving Neighbors Program

Download Basic ECG Course with 2015 ACLS Algorithms

Download STEMI Assistant

Download ECG ID of SADS CONDITIONS

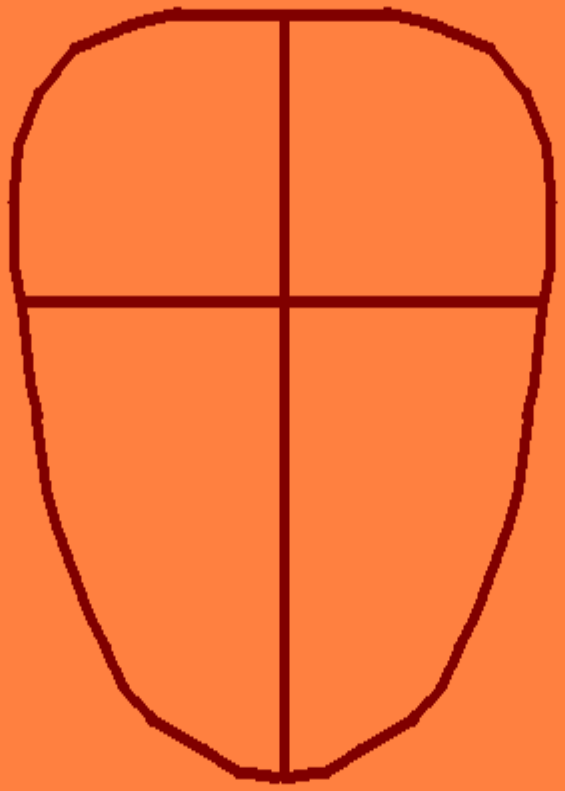
Download ECG Review of Hypertrophy

Download 14 Point AHA Screening Form for Genentic and Congenital Heart Conditions

The Heart:

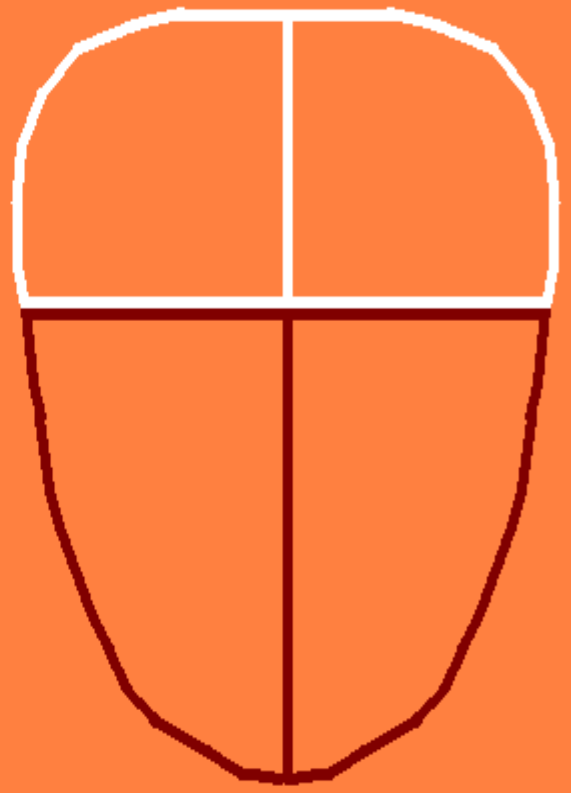
-Muscle cells
-Electrical system cells
-Connective tissue

FOUR CHAMBERED PUMP



FOUR CHAMBERED PUMP . . .

2 ATRIUM

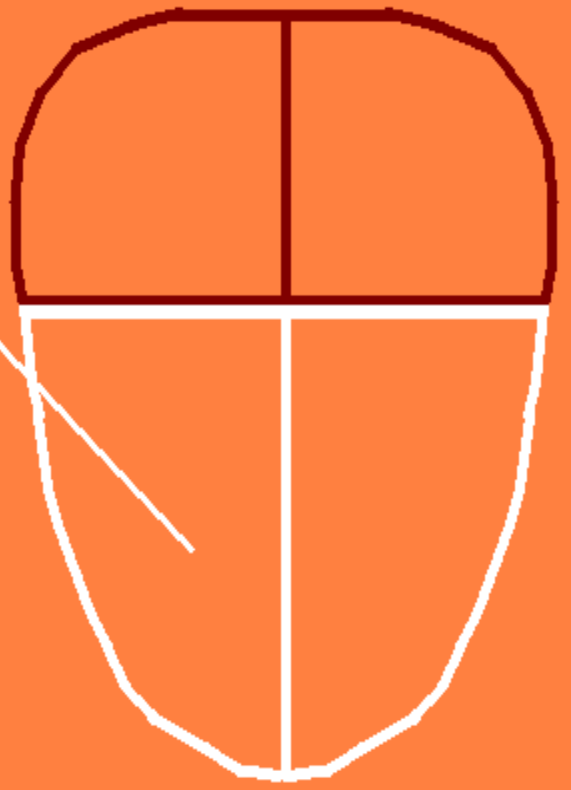


PRIMARY JOB:

"PACK VENTRICLES
FULL OF BLOOD"

FOUR CHAMBERED PUMP . . .

2 VENTRICLES



PRIMARY JOB:

"PUMP BLOOD TO THE LUNGS AND THE REST OF THE BODY"

WHEN FUNCTIONING PROPERLY,

THE ATRIUM SUPPLY

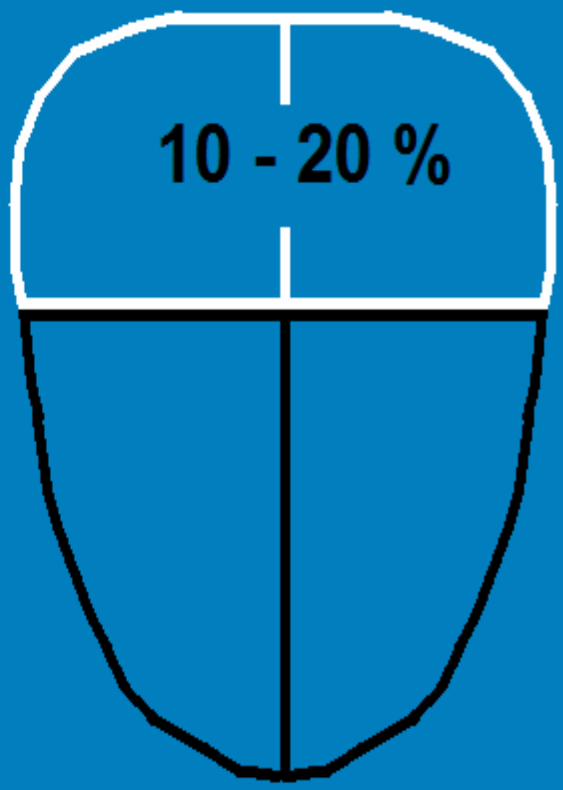
APPROXIMATELY

WHAT

PERCENTAGE

OF THE

CARDIAC OUTPUT ?



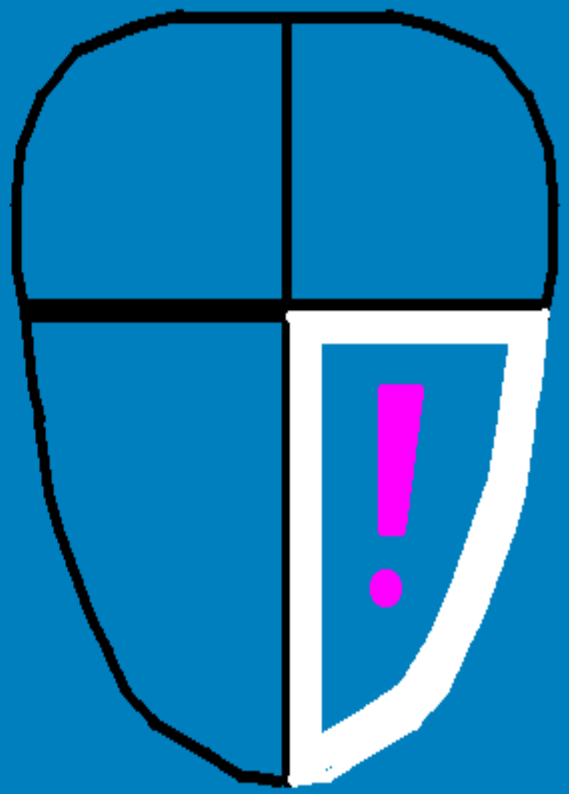
THE CHAMBER MOST IMPORTANT TO KEEPING THE PATIENT ALIVE

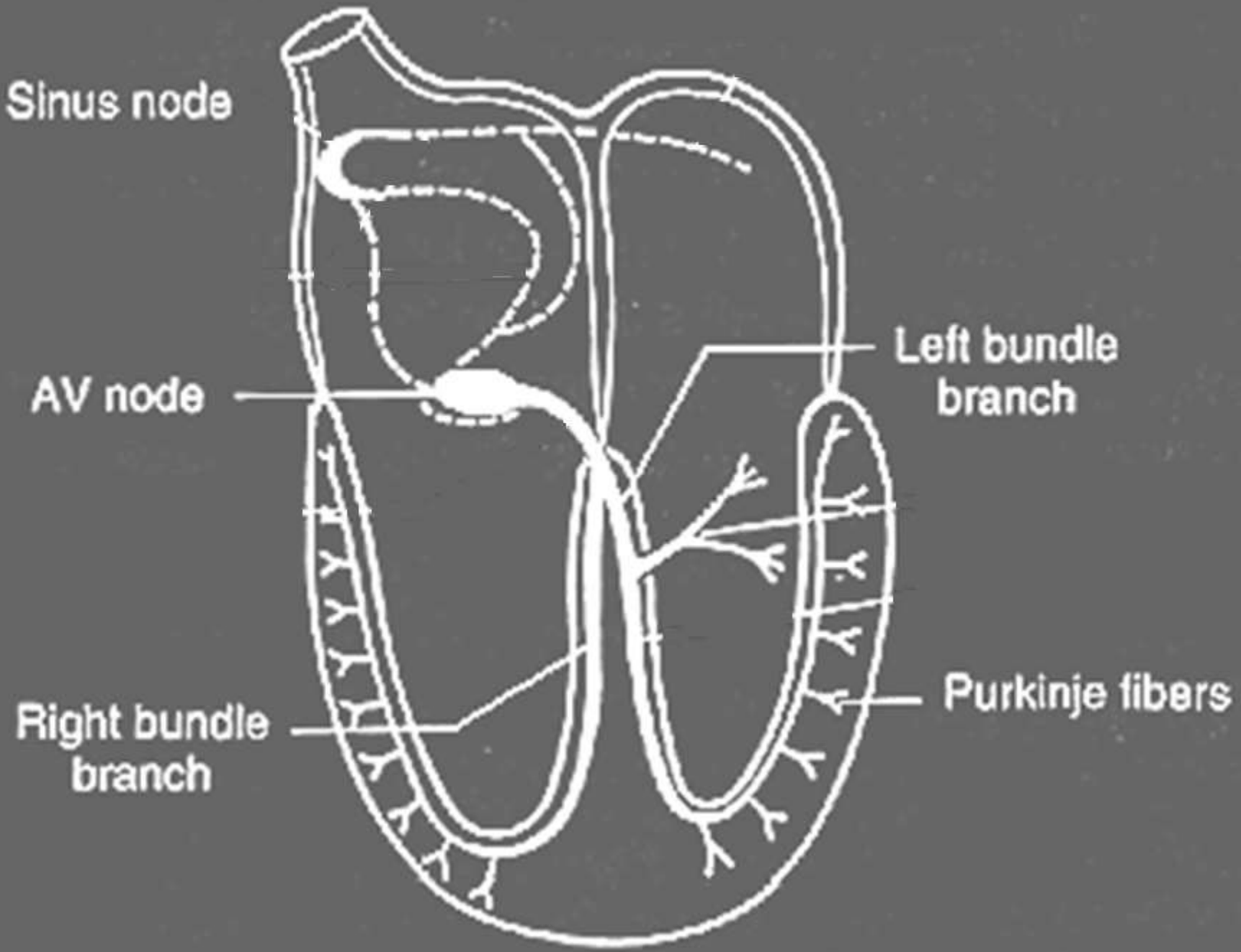
(and the ONLY one you can't live without)

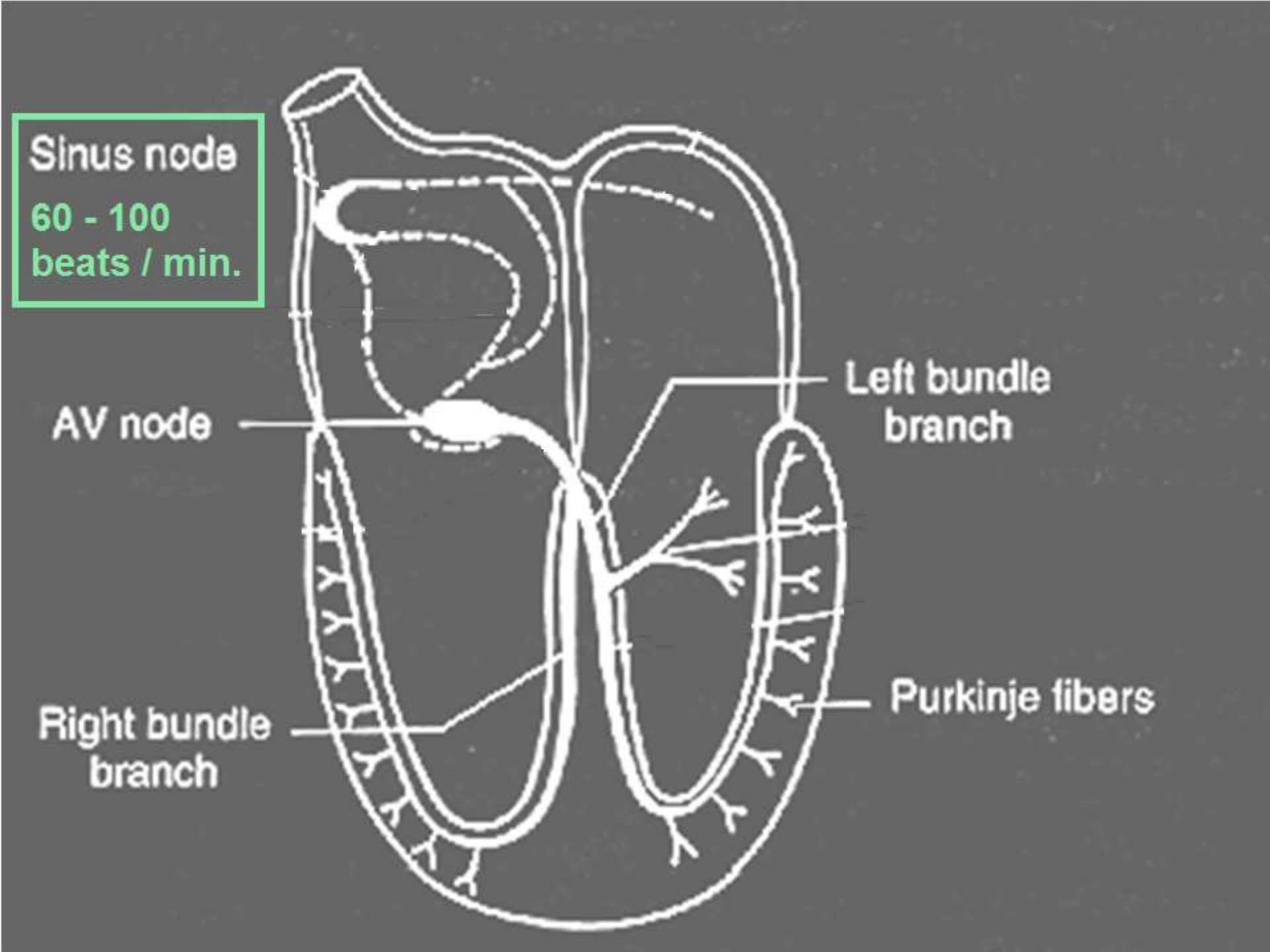
IS THE

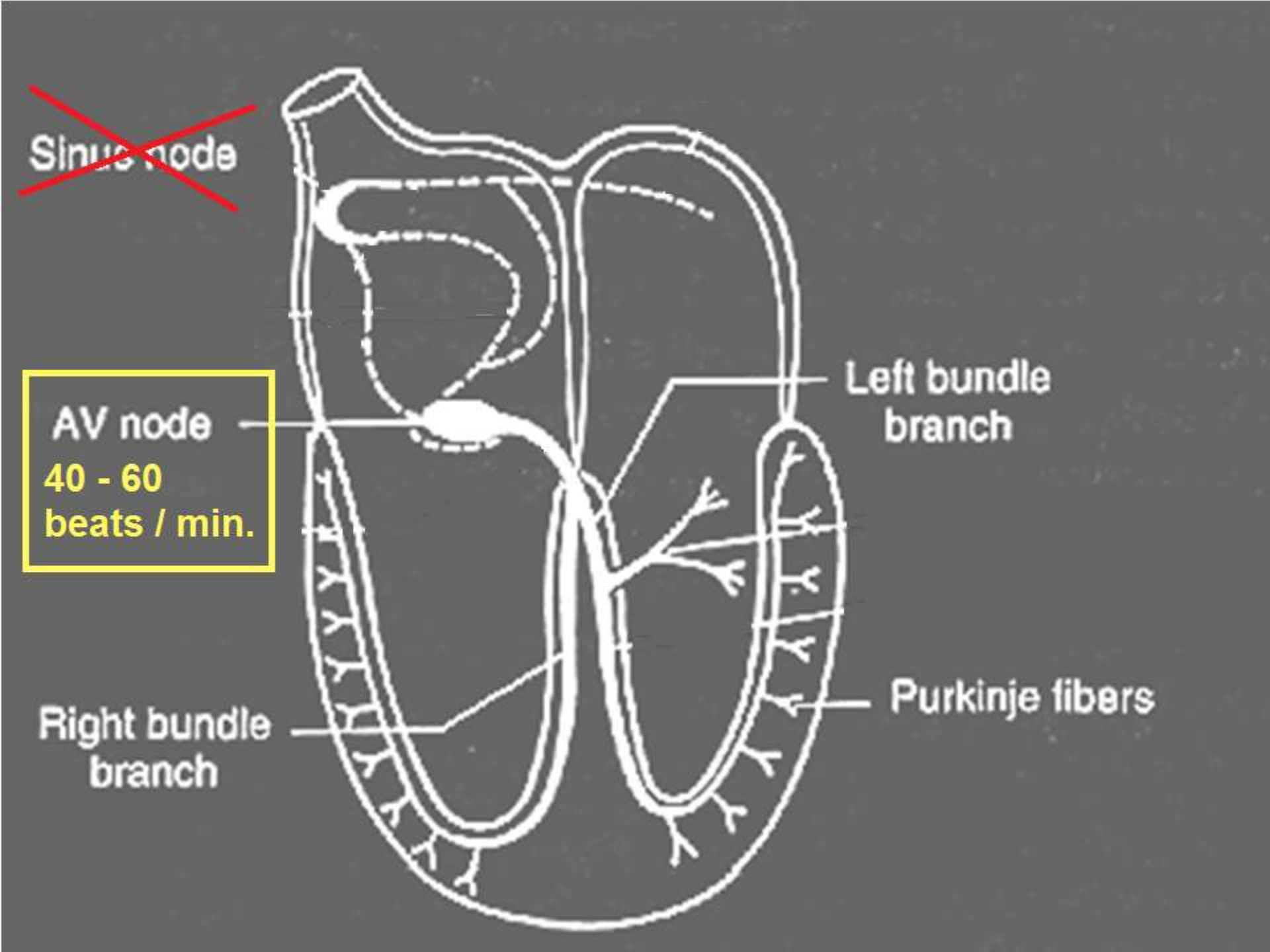
LEFT VENTRICLE

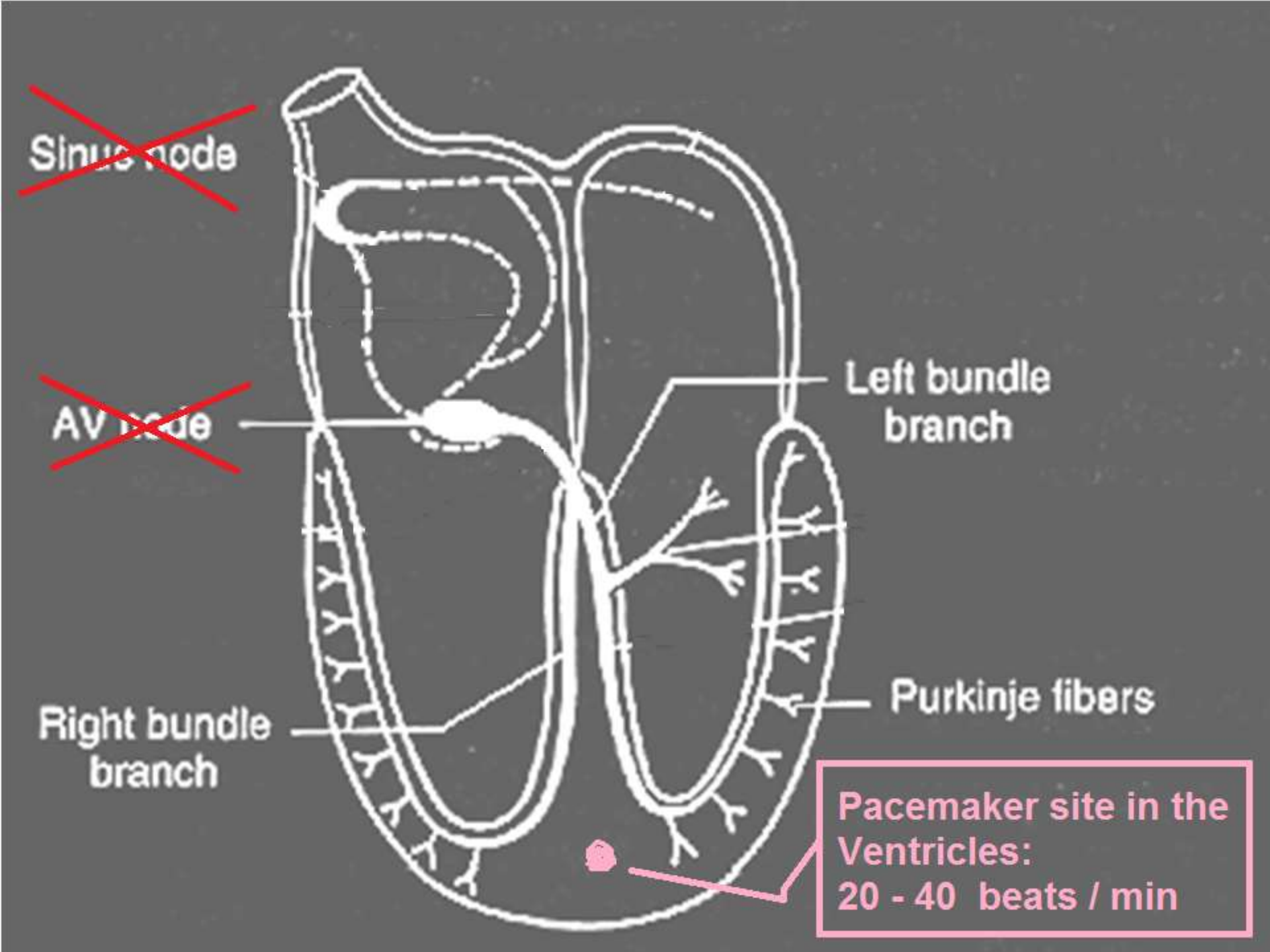
WHICH WE WILL REFER TO AS **THE PUMP**




Sinus node
AV node
Left bundle branch
Right bundle branch
Purkinje fibers


Sinus node
60 - 100
beats / min.
AV node
Left bundle
branch
Right bundle
branch
Purkinje fibers


Sinus node
AV node
40 - 60
beats / min.
Left bundle
branch
Right bundle
branch
Purkinje fibers

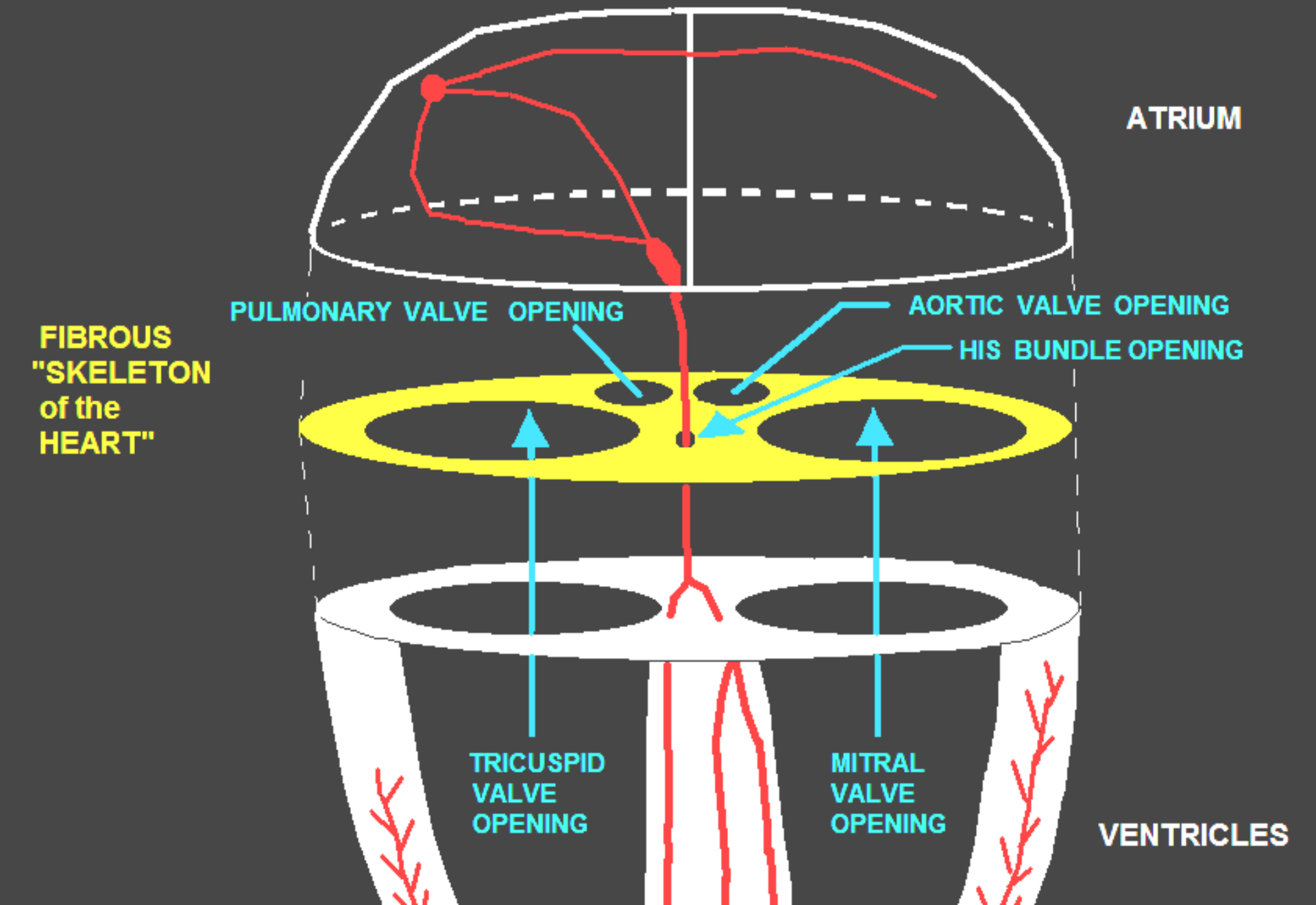

Sinus node
AV node
Left bundle branch
Right bundle branch
Purkinje fibers
Pacemaker site in the Ventricles:
20 - 40 beats / min

NORMAL "INHERENT" RATES:

SA NODE:	60 - 100
AV NODE:	40 - 60
* VENTRICLES:	1 - 40

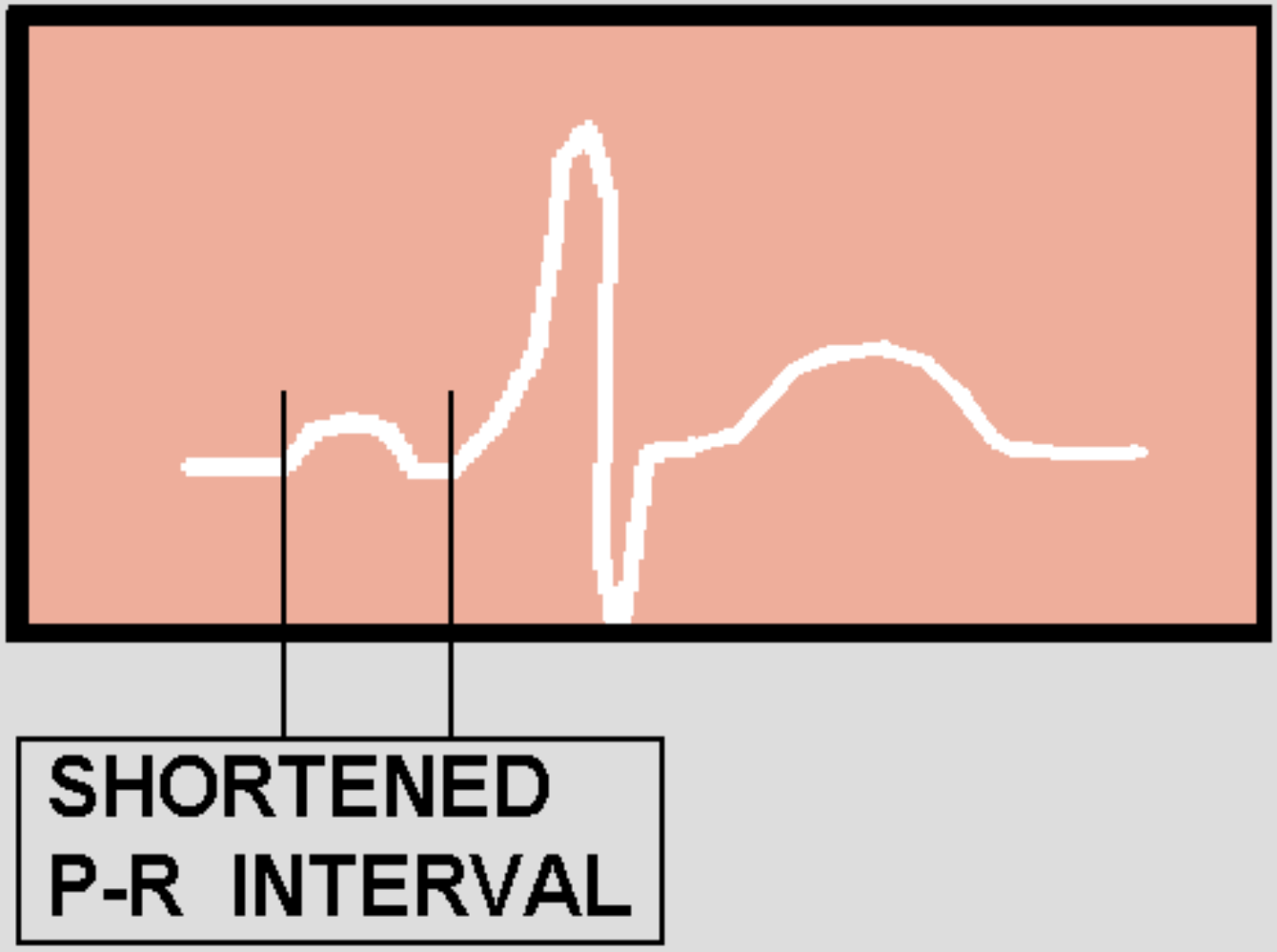
* Most reference sources indicate ventricular focal rates as being between "20-40" beats per minute. Since I have personally witnessed patients who have had regular, pulse-producing "idioventricular" rhythms as low as 4 - 5 beats per minute, I can not endorse "20" as a minimum ventricular rate.

THE "SKELETON OF THE HEART"



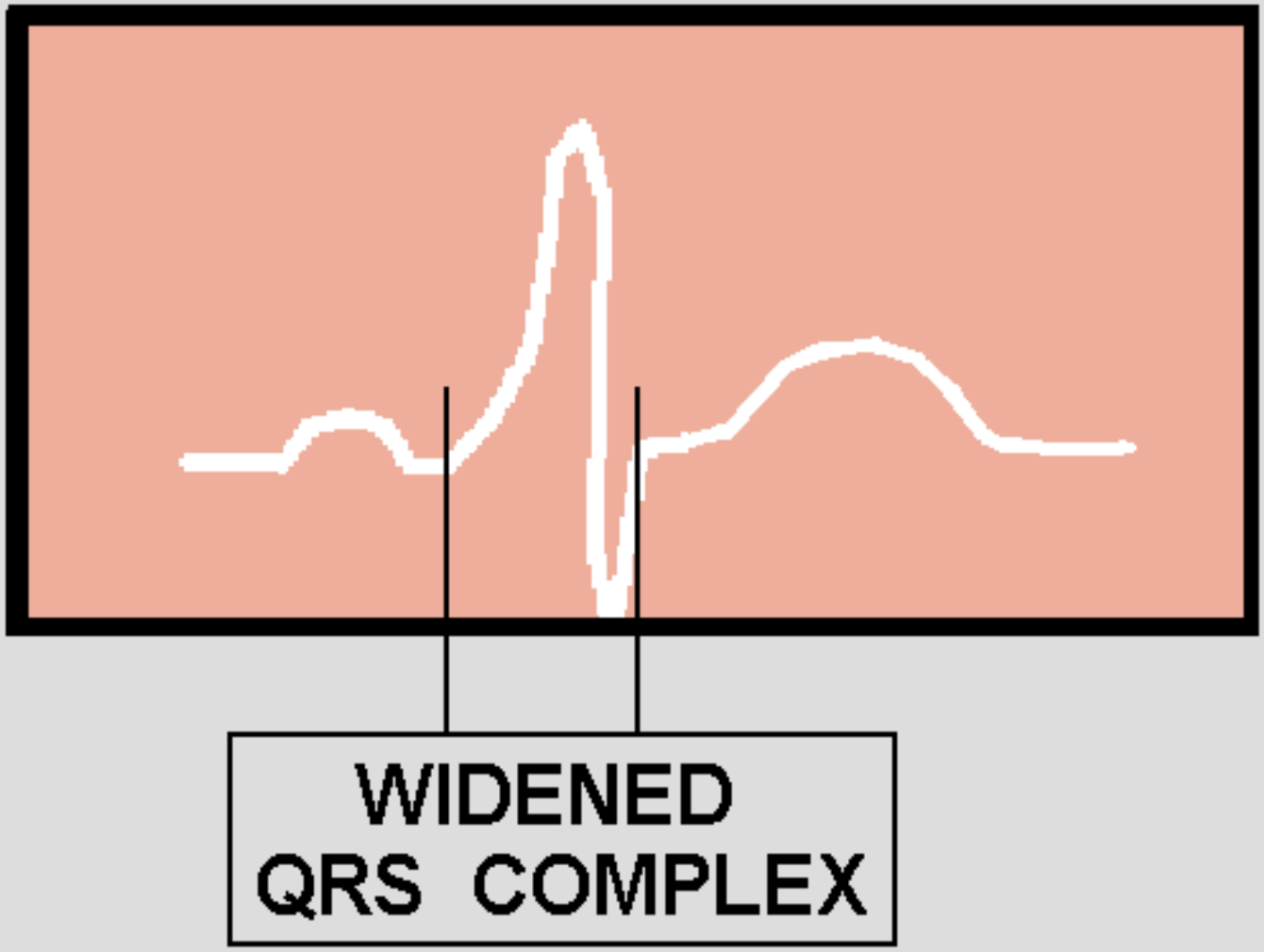
WOLFF-PARKINSON-WHITE

EKG CHARACTERISTICS



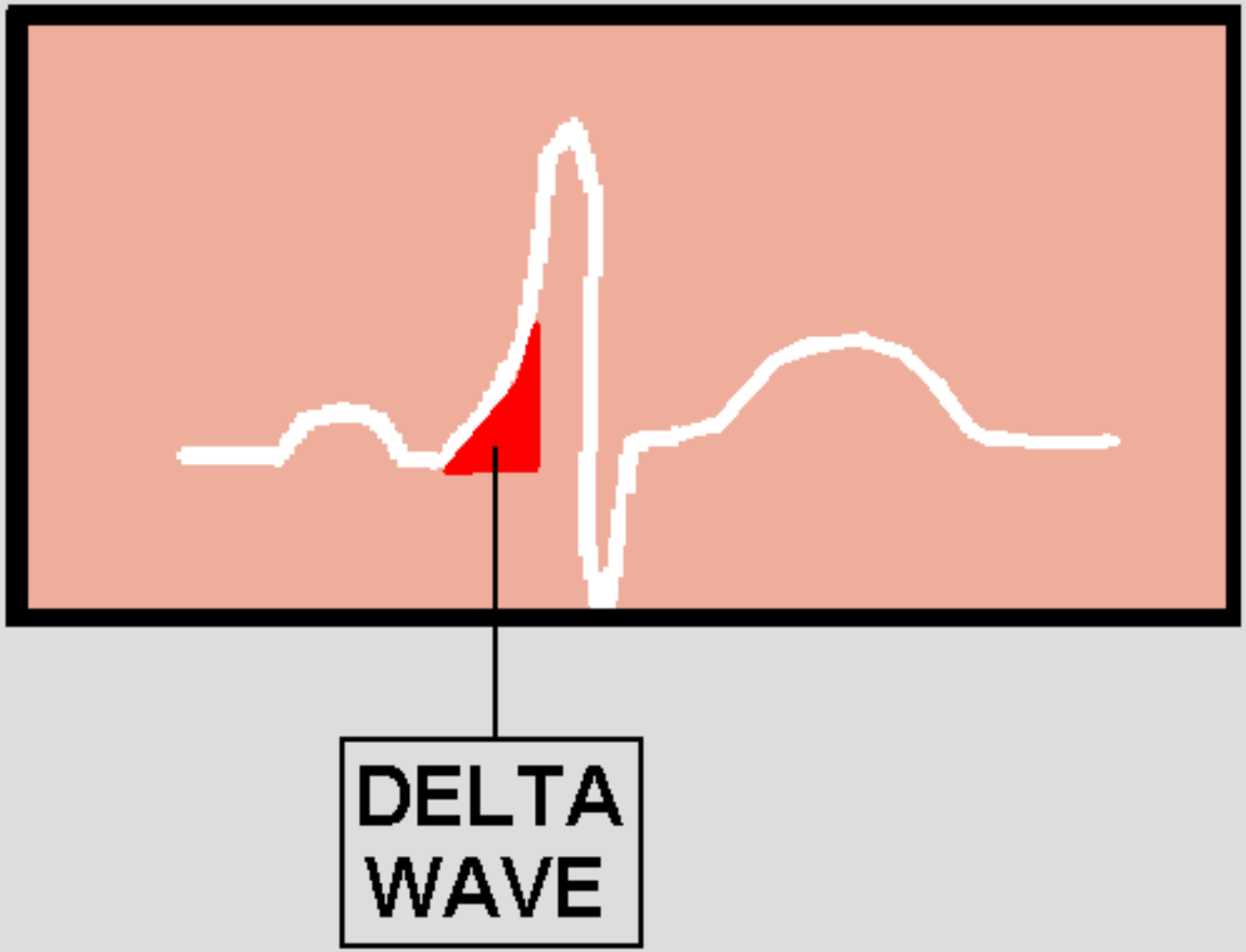
WOLFF-PARKINSON-WHITE

EKG CHARACTERISTICS



WOLFF-PARKINSON-WHITE

EKG CHARACTERISTICS



17-MAY-1997 15:32:09 ST. JOSEPH'S WOMEN'S-WOMEN' ROUTINE RETRIEVAL

16 yr
Female Caucasian

Room:REC
Loc:20 Option:50

Vent. rate	92	BPM
PR interval	112	ms
QRS duration	118	ms
QT/QTc	356/440	ms
P-R-T axes	59 -22	107

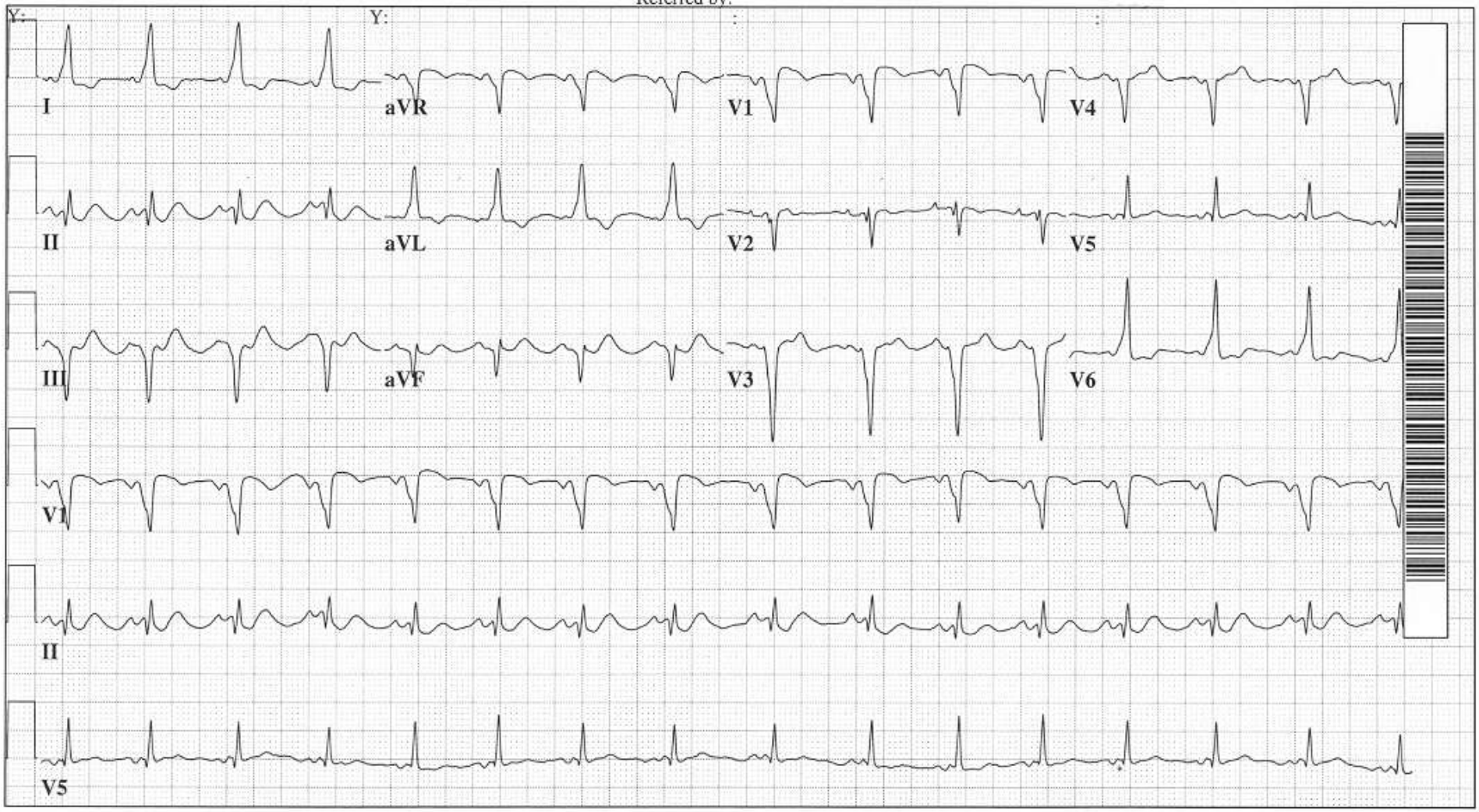
Normal sinus rhythm with sinus arrhythmia
Left atrial enlargement
Anterior infarct , age undetermined
Inferior infarct , age undetermined
ST & T wave abnormality, consider lateral ischemia
Wolff-Parkinson-White
Abnormal ECG
No previous ECGs available

History:Unknown
Technician: DP
Test ind:EKG

EKG CLASS #WR030100
60783

WOLFF-PARKINSON-WHITE TYPE B

Referred by:



25mm/s 10mm/mV 40Hz 005C 12SL 250 CID: 12

EID:18 EDT: 16:01 17-MAY-1997 ORDER:

16 yr
Female Caucasian

Room:REC
Loc:20 Option:50

Vent. rate	92	BPM
PR interval	112	ms
QRS duration	118	ms
QT/QTc	356/440	ms
P-R-T axes	59 -22	107

Normal sinus rhythm with sinus arrhythmia
Wolff-Parkinson-White
Abnormal ECG
No previous ECGs available

History:Unknown
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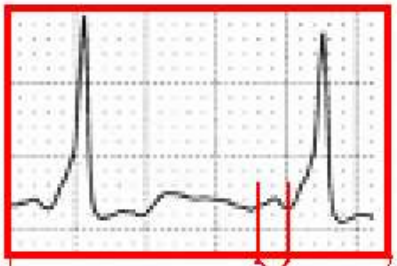
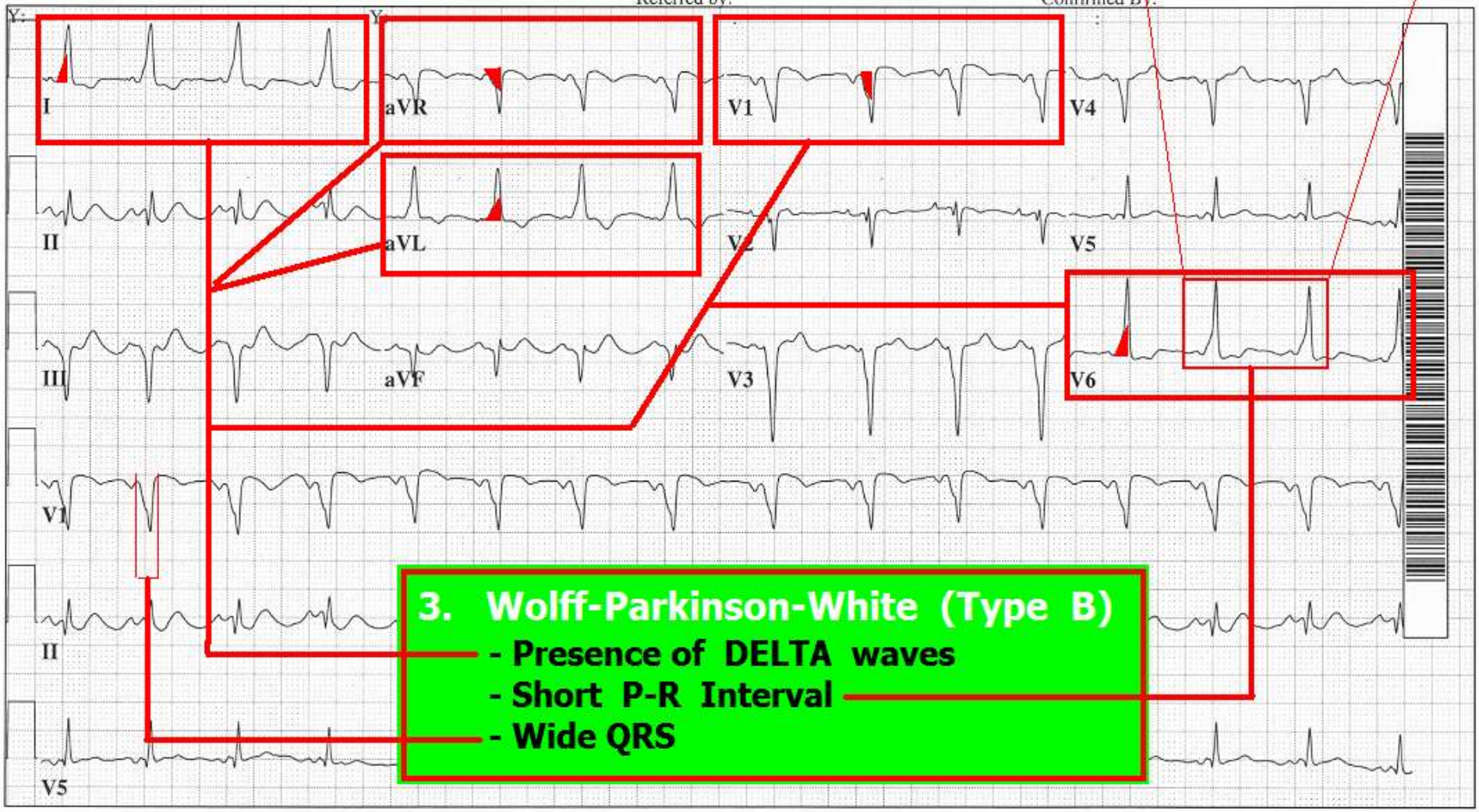
60783



P-R = .08

Referred by:

Confirmed By:



3. Wolff-Parkinson-White (Type B)

- **Presence of DELTA waves**
- **Short P-R Interval**
- **Wide QRS**

25mm/s 10mm/mV 40Hz 005C 12SL 250 CID: 12

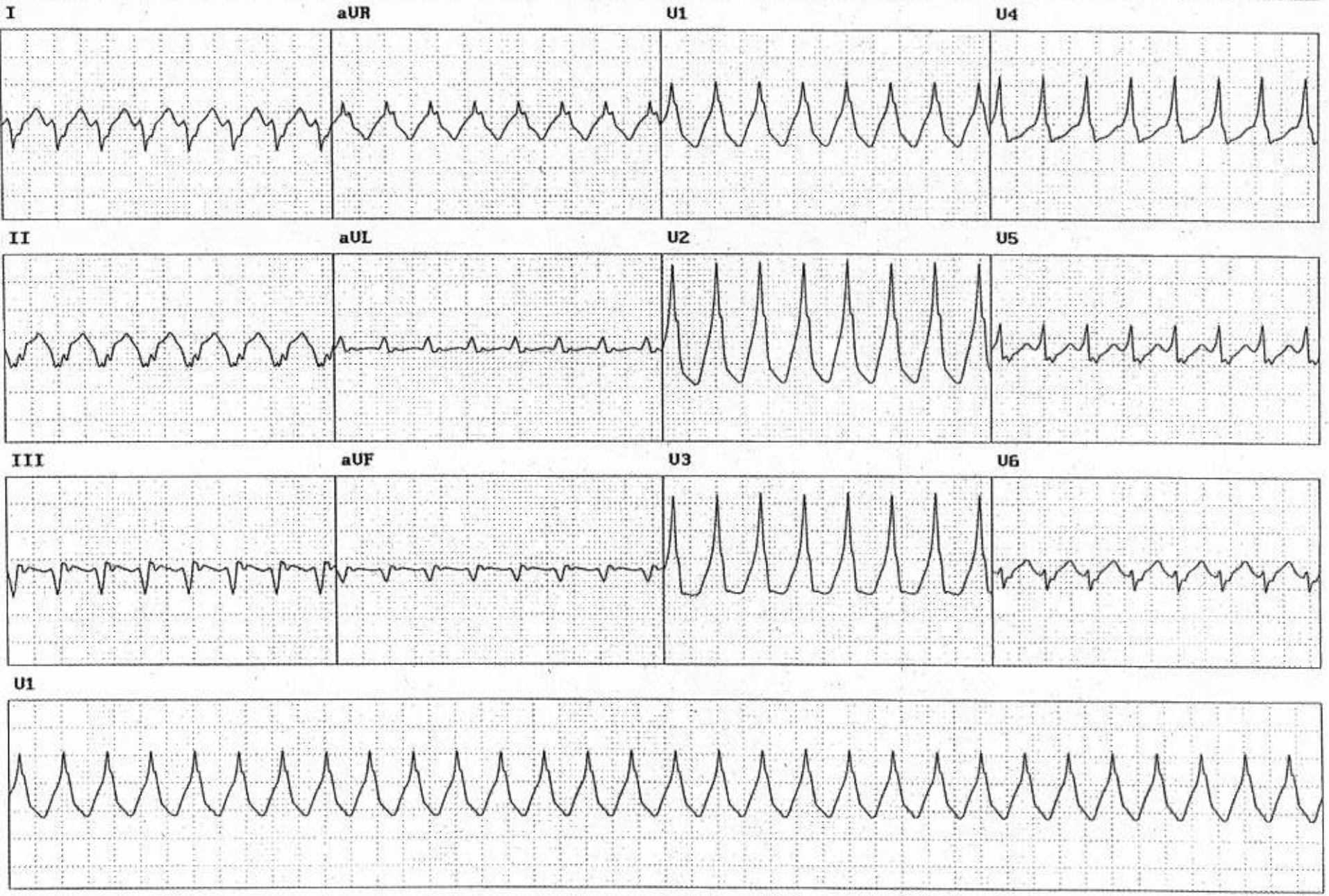
EID:18 EDT: 16:01 17-MAY-1997 ORDER:

W-P-W patients often experience Tachycardias:

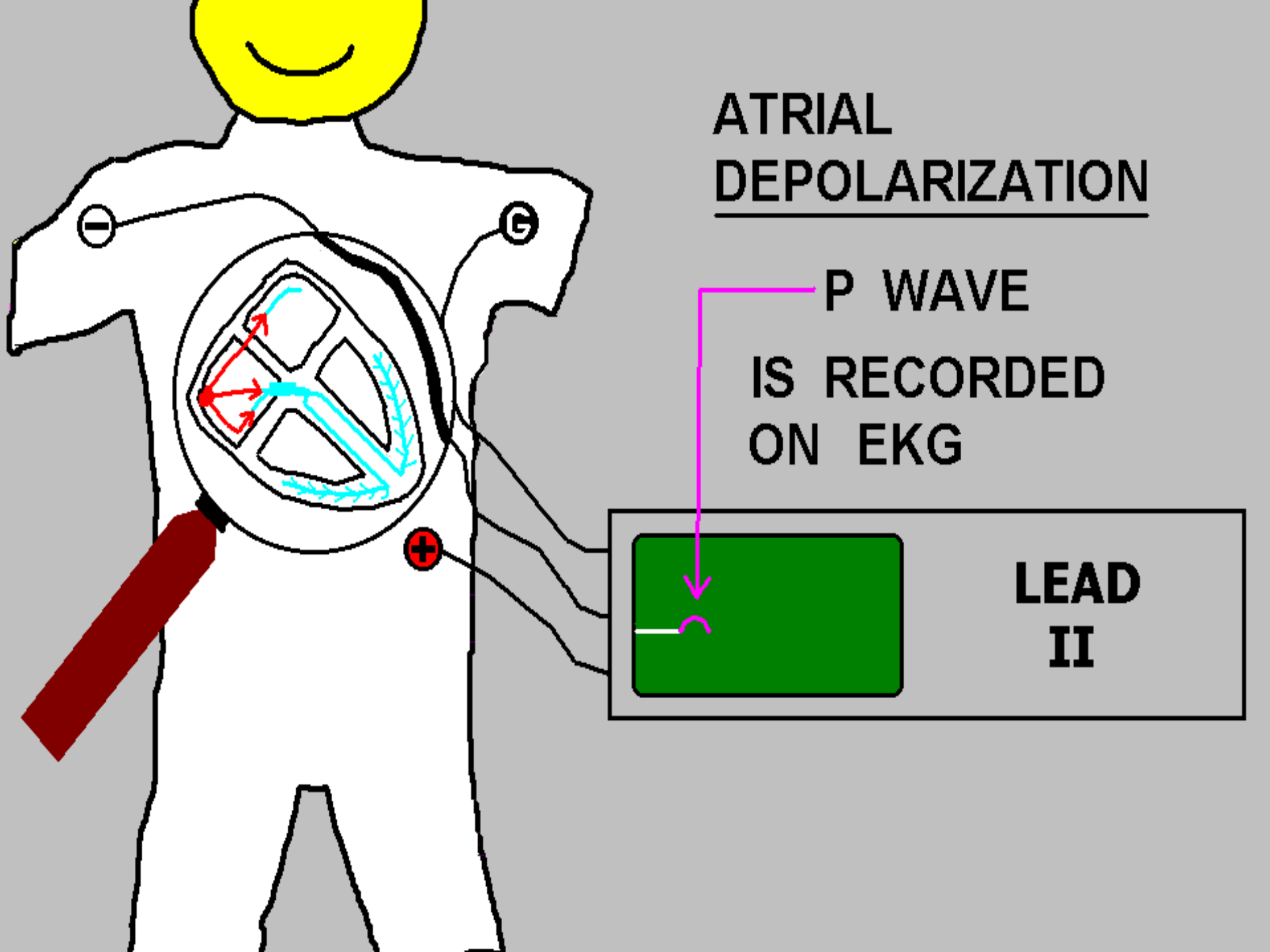
- Narrow QRS Tachycardia (SVT)
- Wide QRS Tachycardia (mimics V-Tach.

The same patient can present with narrow QRS SVT, and at another time, Wide QRS Tachycardia …….

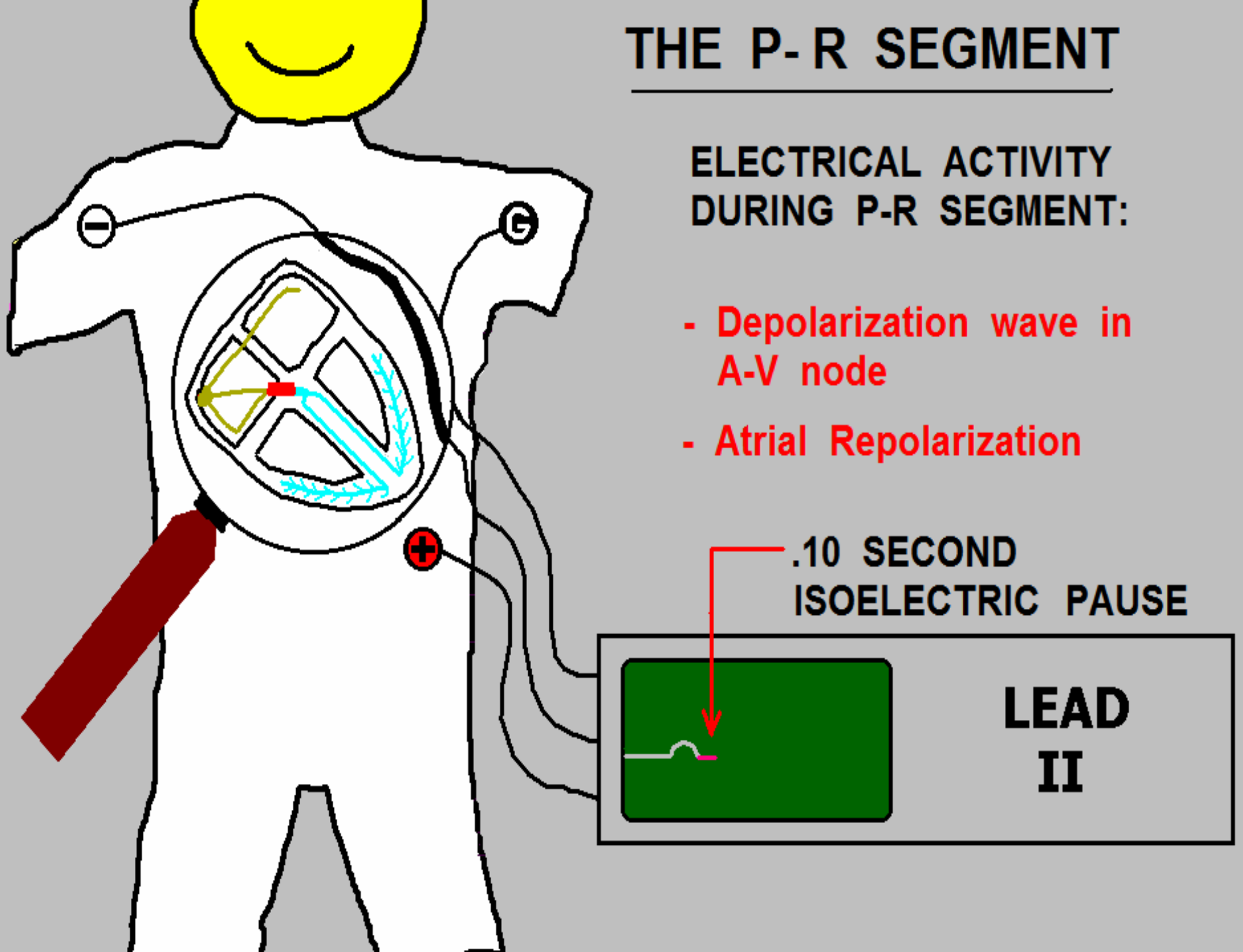
05/04/99 14:16:00 25mm/sec 4.2mm/mU

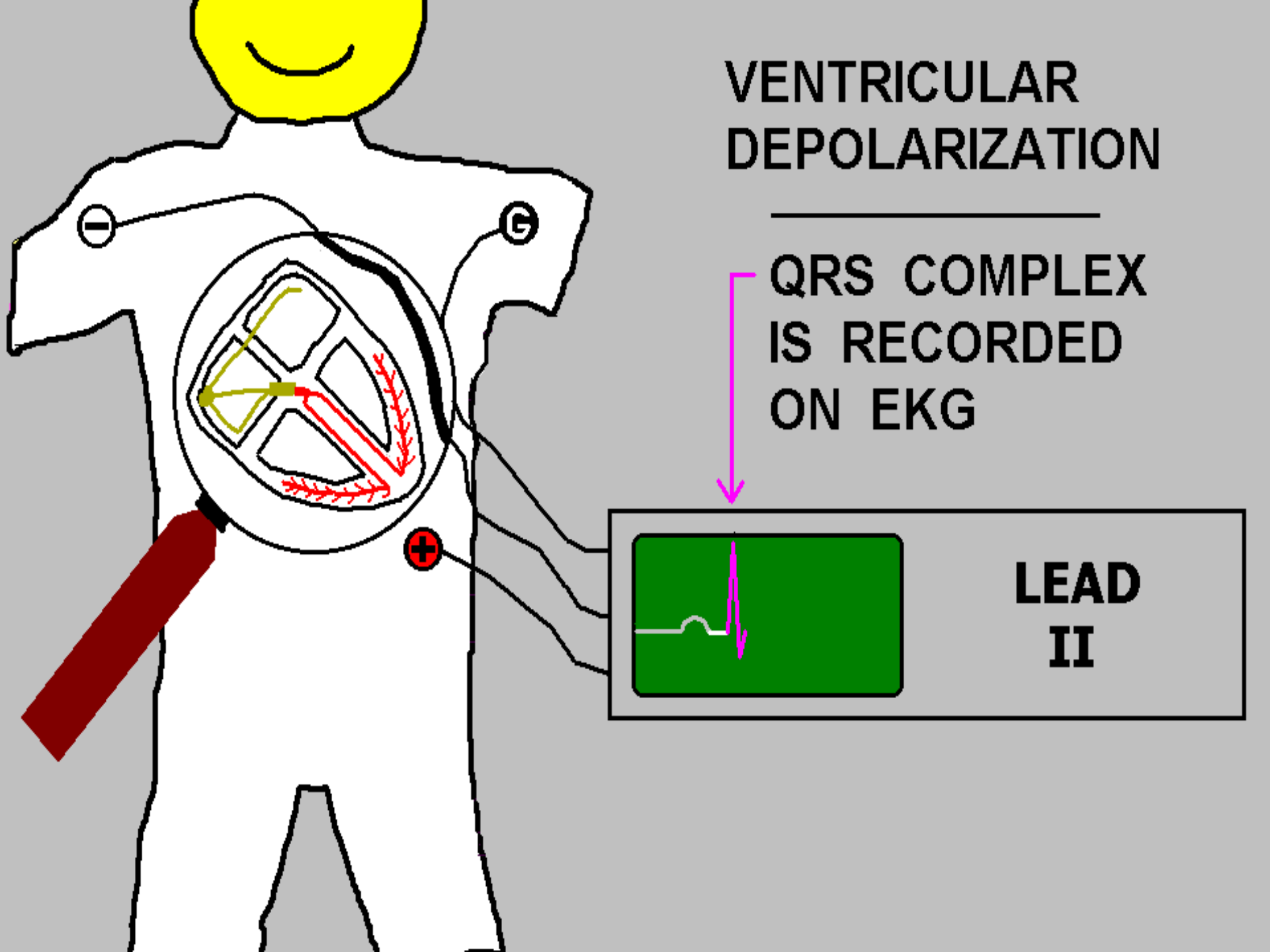


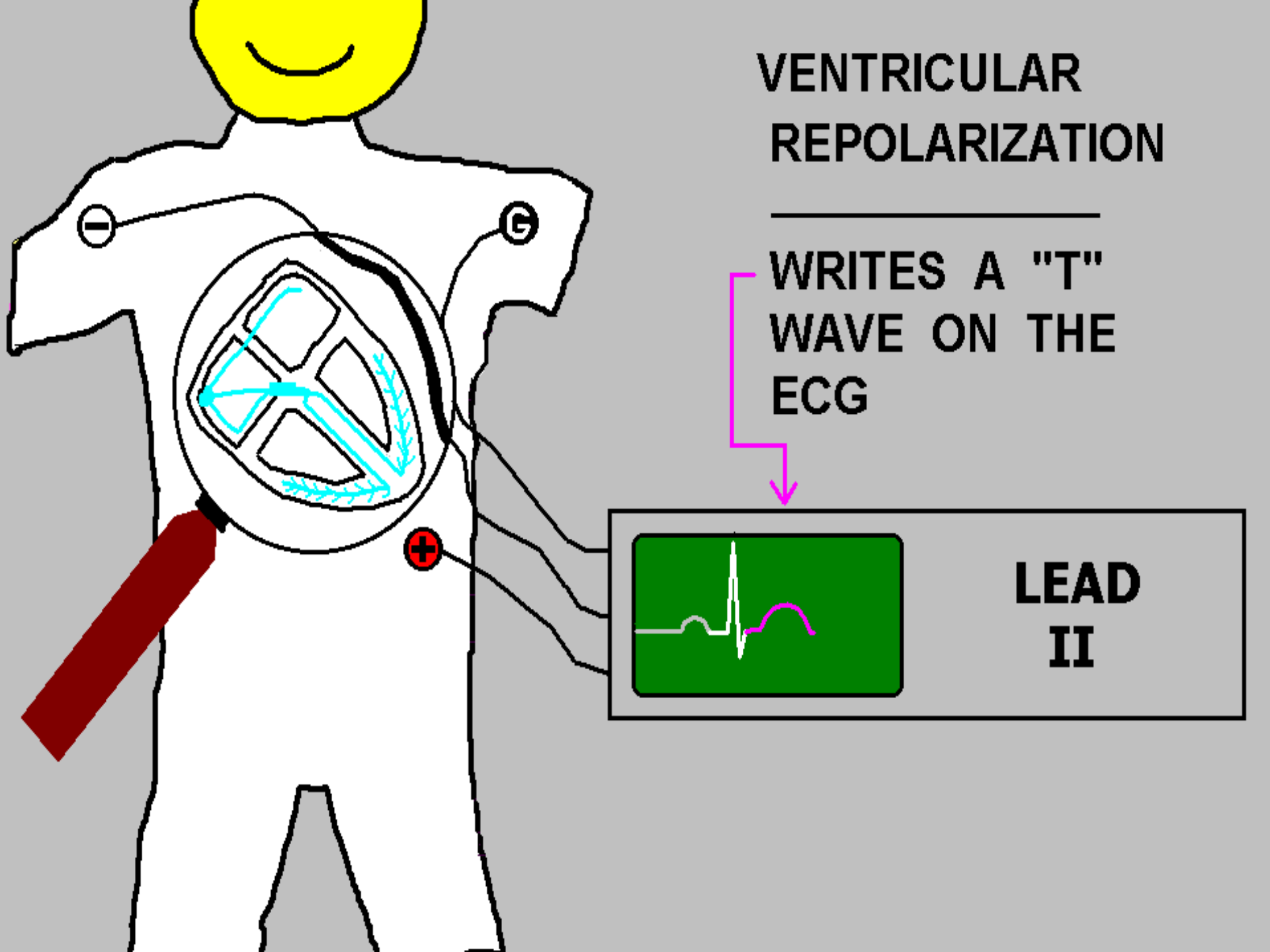
ST. JOSEPH'S HOSPITAL W-P-W DOUBLE BY-PASS TRACT

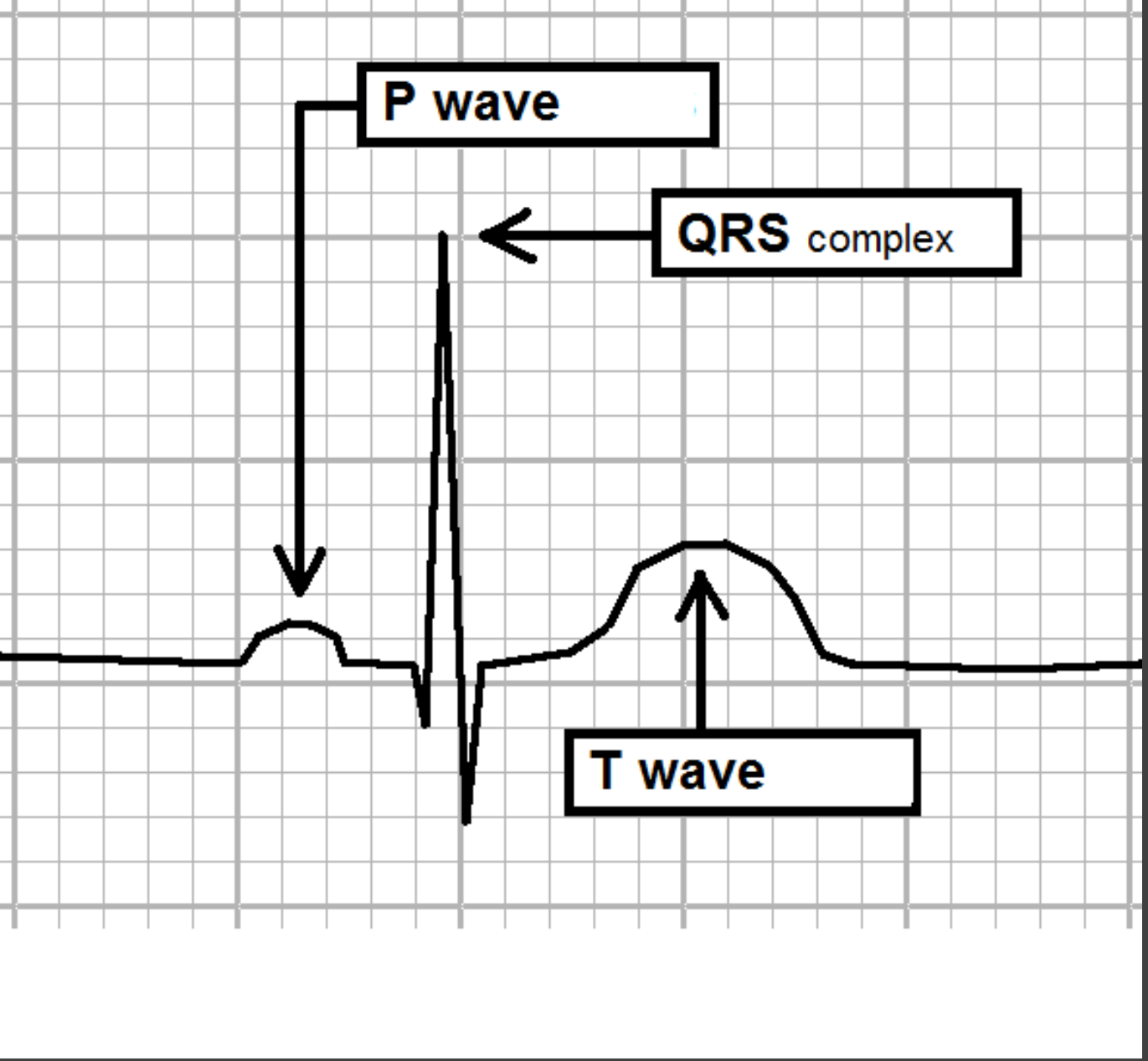

ATRIAL
DEPOLARIZATION
P WAVE
IS RECORDED
ON EKG
LEAD
II

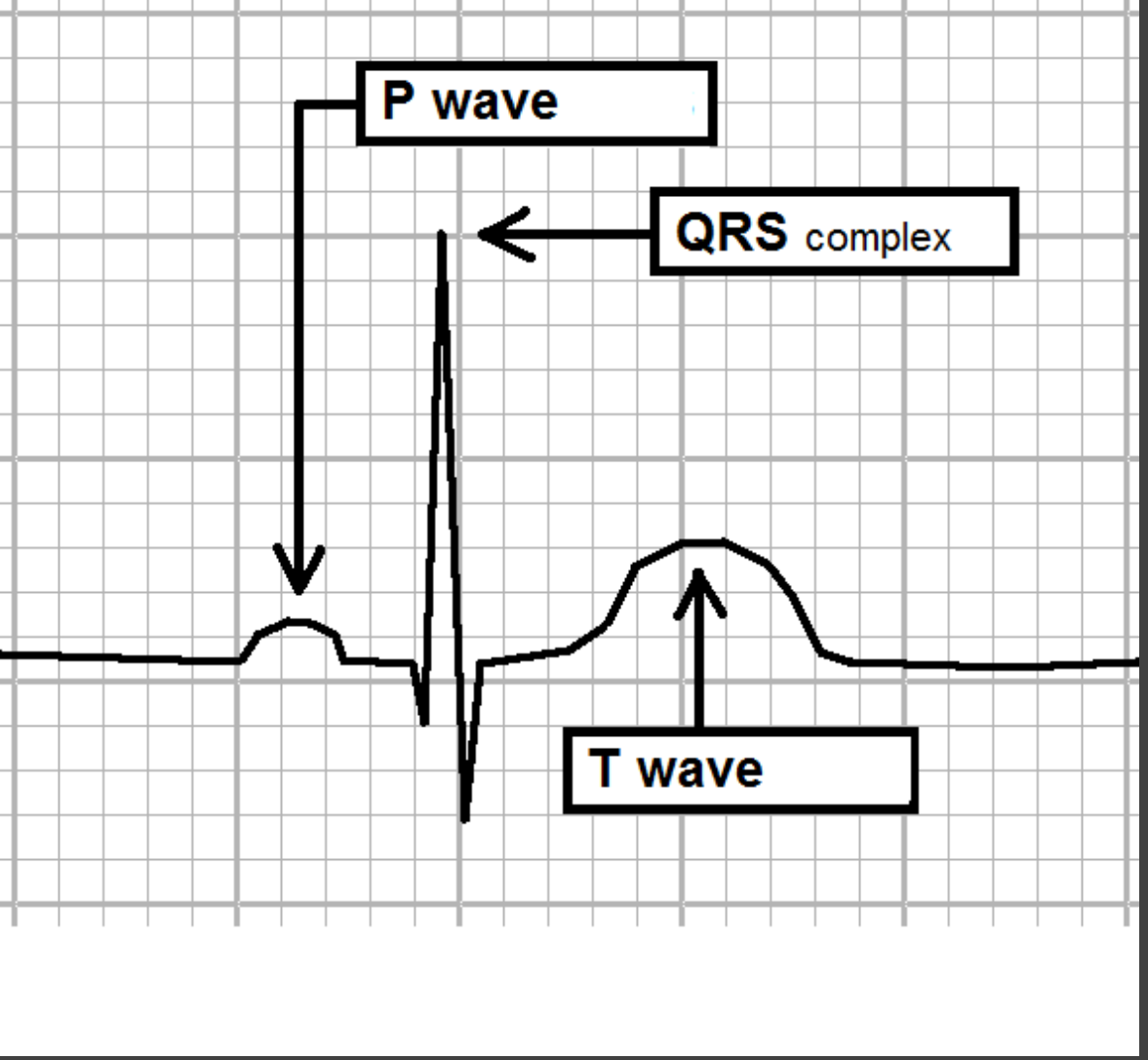
THE P-R SEGMENT




VENTRICULAR
DEPOLARIZATION
QRS COMPLEX
IS RECORDED
ON EKG
LEAD
II


VENTRICULAR
REPOLARIZATION
WRITES A "T"
WAVE ON THE
ECG
LEAD
II


P wave
QRS complex
T wave

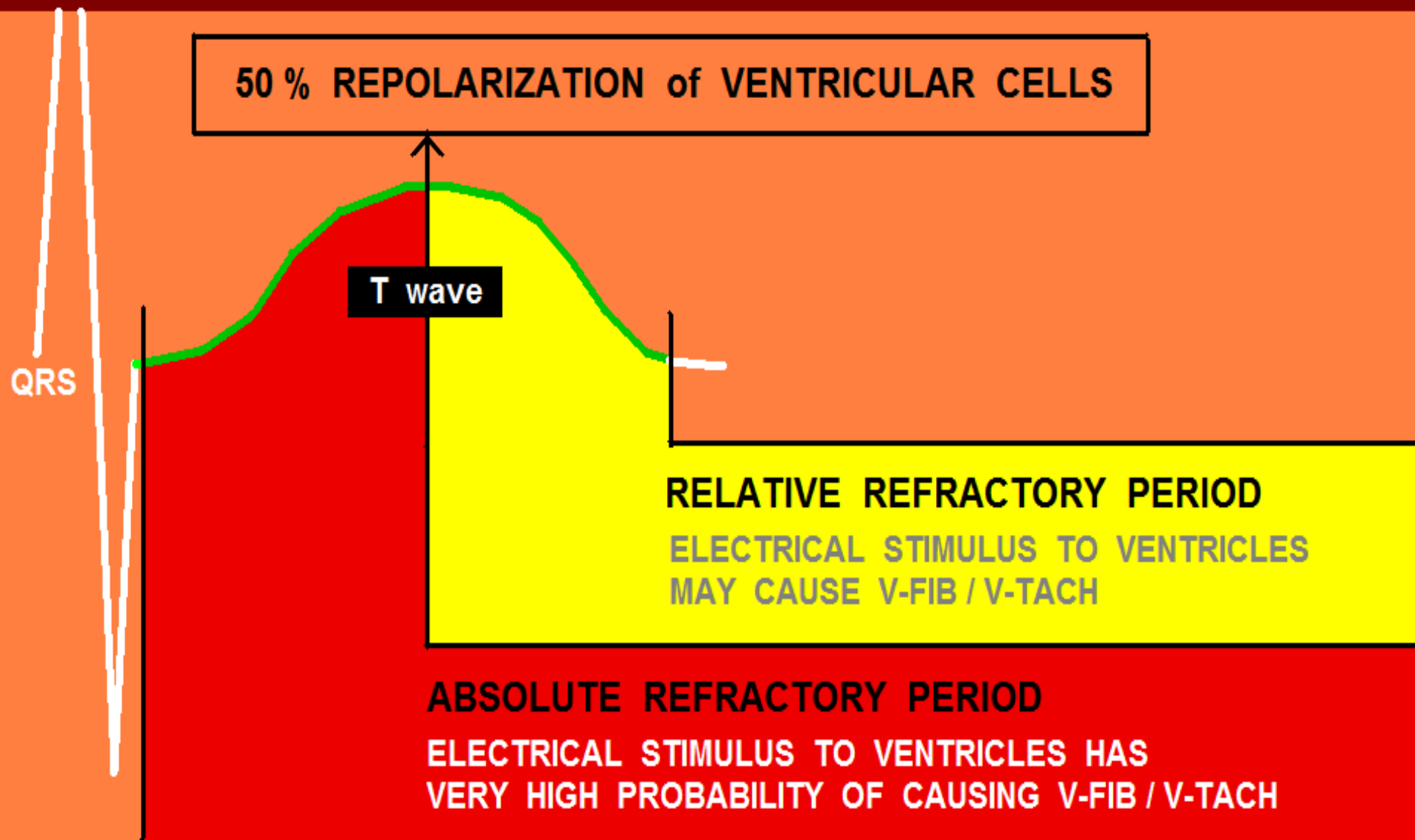


P WAVE =
ATRIAL DEPOLARIZATION

QRS COMPLEX =
VENTRICULAR DEPOLARIZATION (contracting)

T WAVE =
VENTRICULAR REPOLARIZATION (recharging)

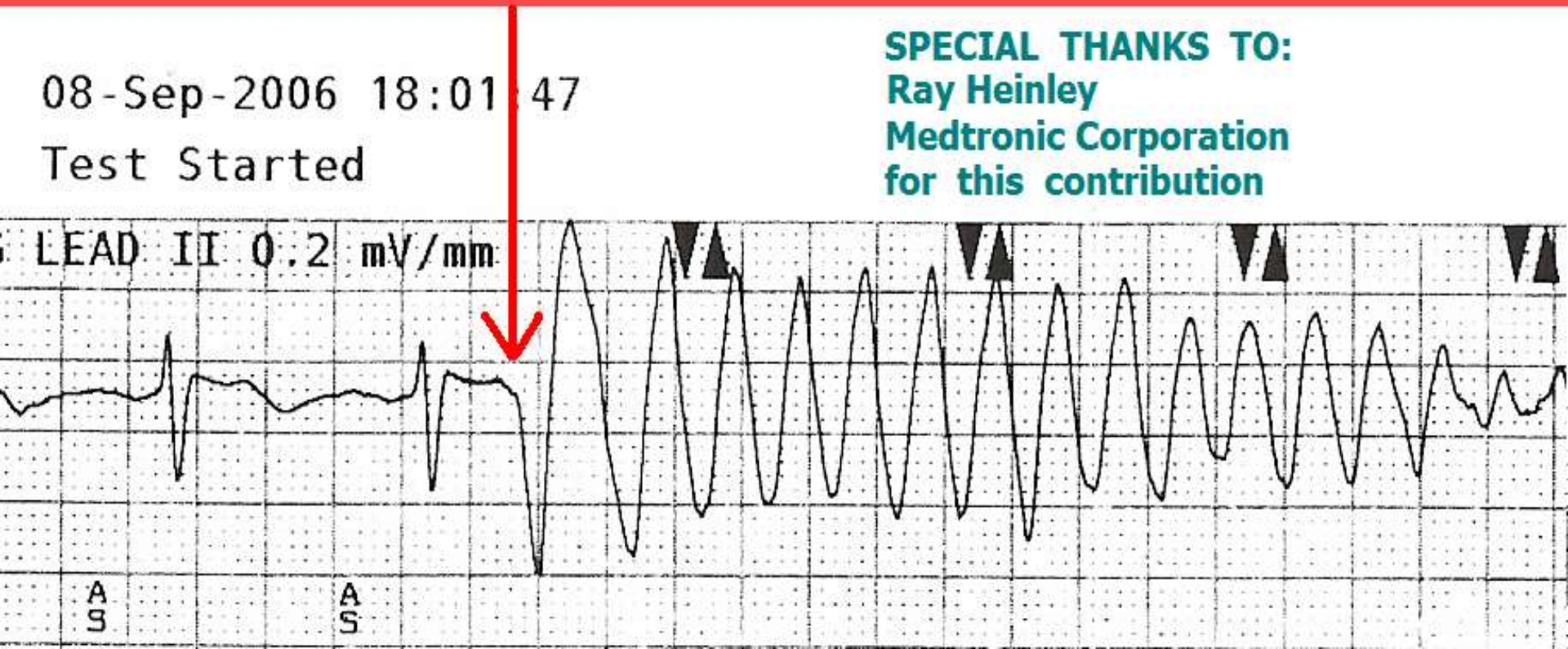
CARDIAC ANATOMY and PHYSIOLOGY "101"



ROUTINE TEST OF ICD

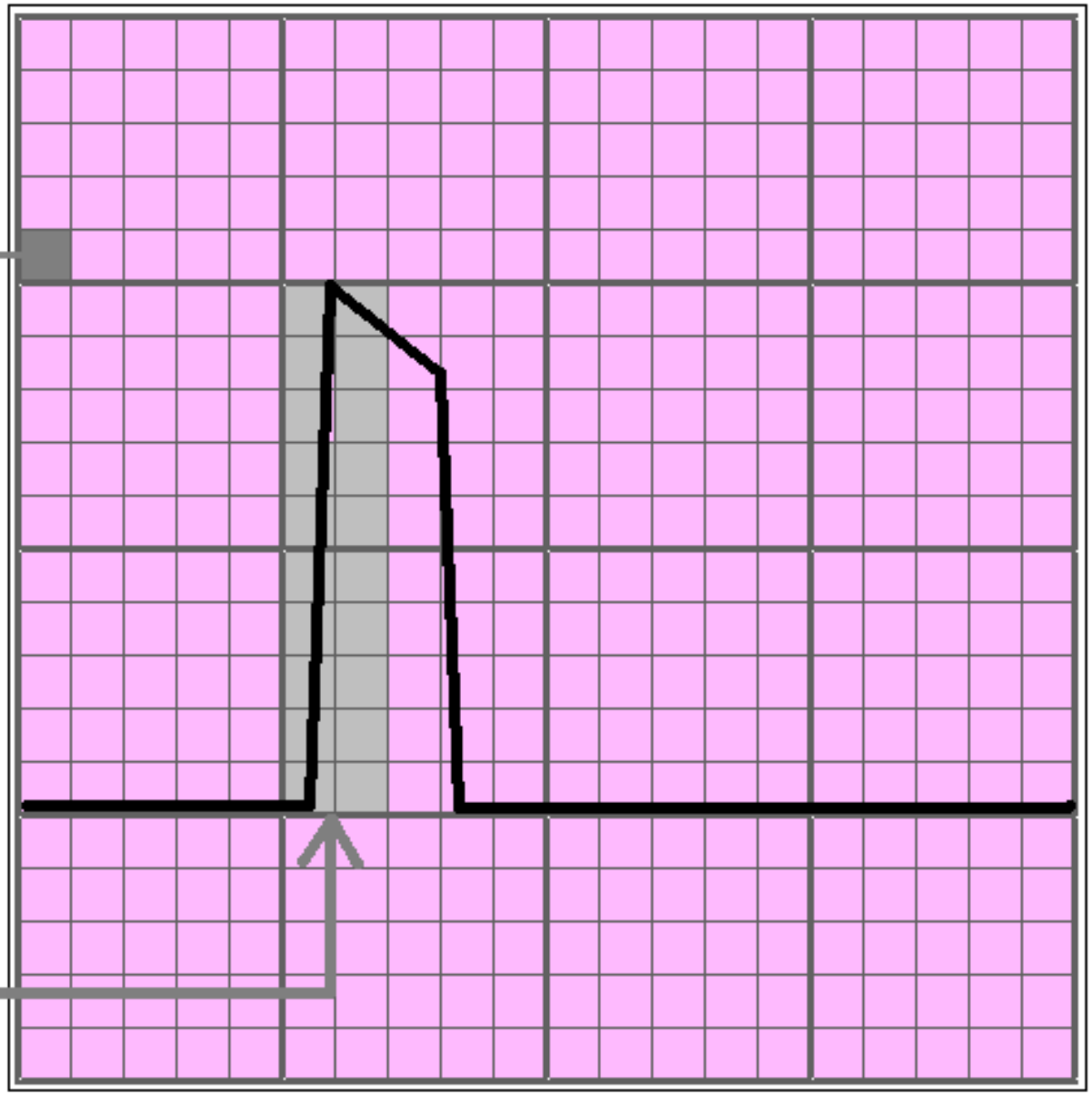
ELECTRICAL IMPULSE ADMINISTERED DURING ABSOLUTE REFRACTORY PERIOD -- INDUCES VENTRICULAR FIBRILLATION

SPECIAL THANKS TO:
Ray Heinley
Medtronic Corporation
for this contribution



ECG PAPER - THE VERTICAL AXIS:

- SMALL BOXES = 1mm SQUARES
- THE VERTICAL AXIS REPRESENTS AMPLITIUDE (VOLTAGE)
- IN VERTICAL DIRECTION, THERE ARE 5 SMALL BOXES IN EACH LARGE (5mm) BOX
- 1 mv CALIBRATION SPIKE = 10 mm



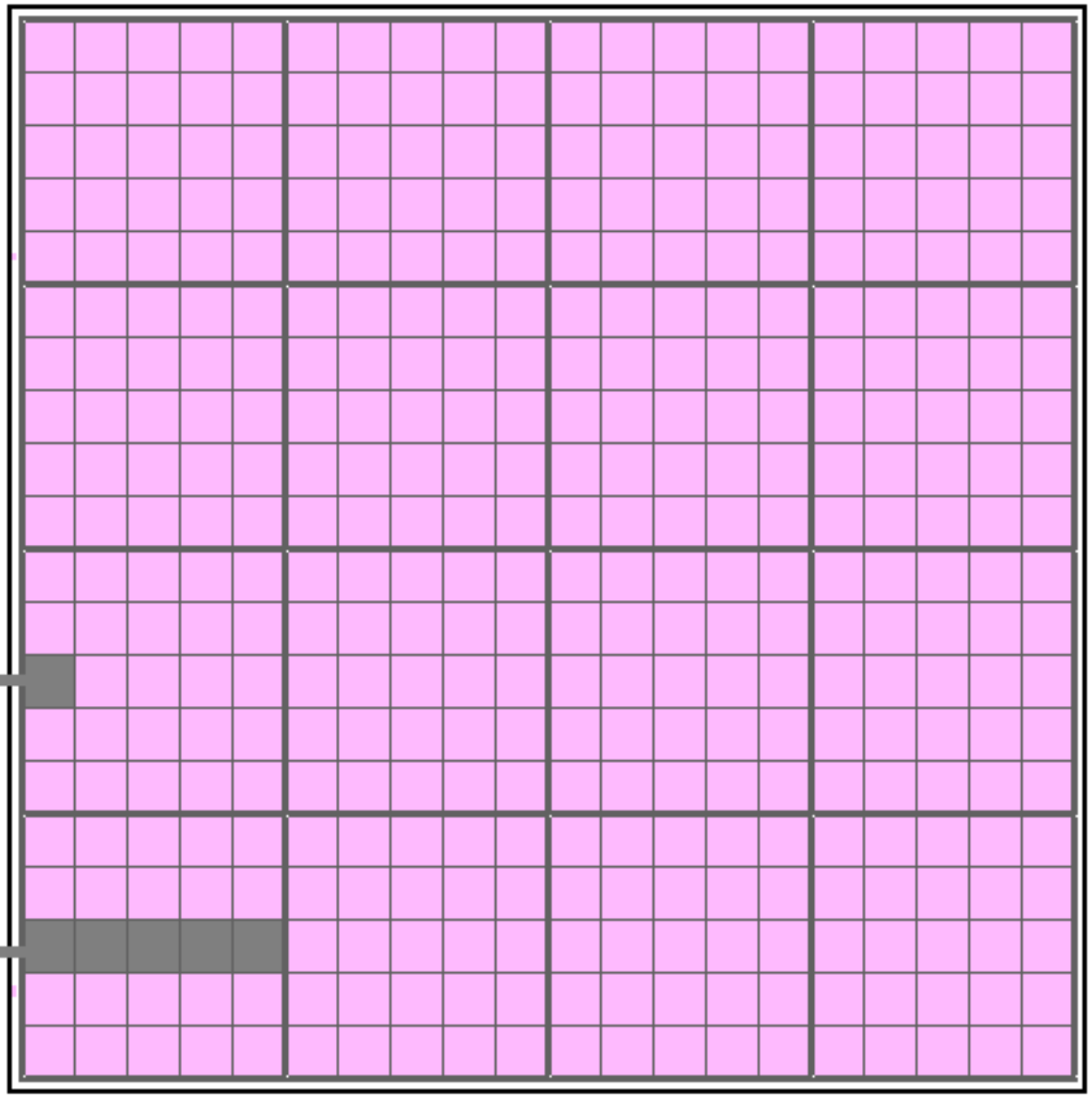
ECG PAPER - THE HORIZONTAL AXIS:

THE HORIZONTAL AXIS REPRESENTS TIME . . .

STANDARD SPEED FOR RECORDING ADULT EKGs = 25 mm / SECOND

EACH 1mm BOX = .04 SECONDS, or 40 MILLISECONDS (40 ms)

5 SMALL BOXES = .20 SECONDS, or 200 MILLISECONDS (200 ms)

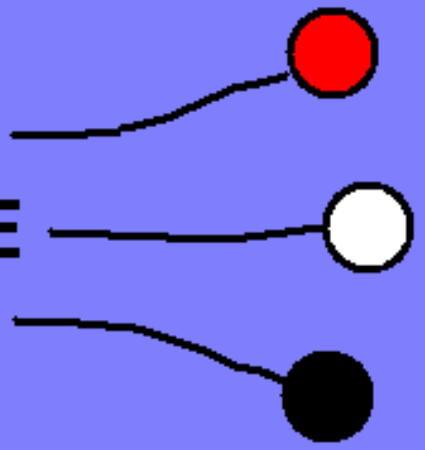


THE EKG MACHINE

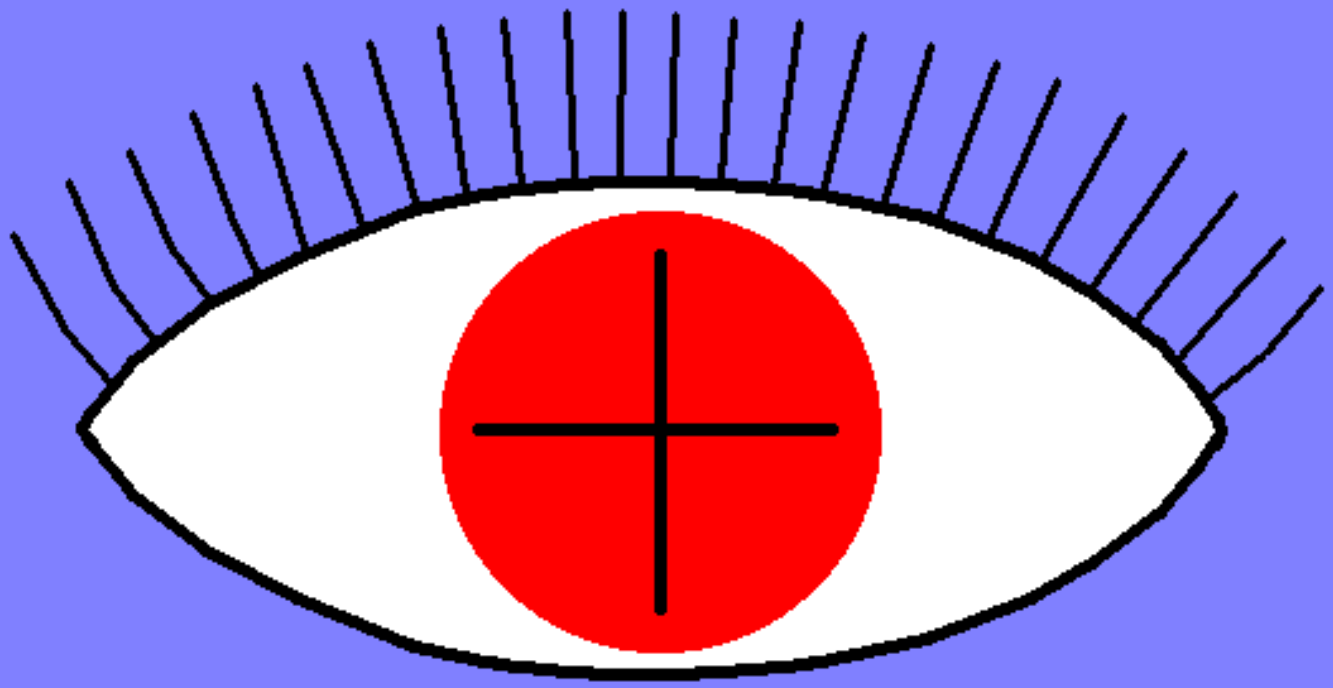
STANDARD 12 LEADS - USES 10 WIRES
(6 CHEST and 4 LIMB)

- I, II, III, and V1, V2, V3, V4, V5, V6
EACH CONSIST OF:

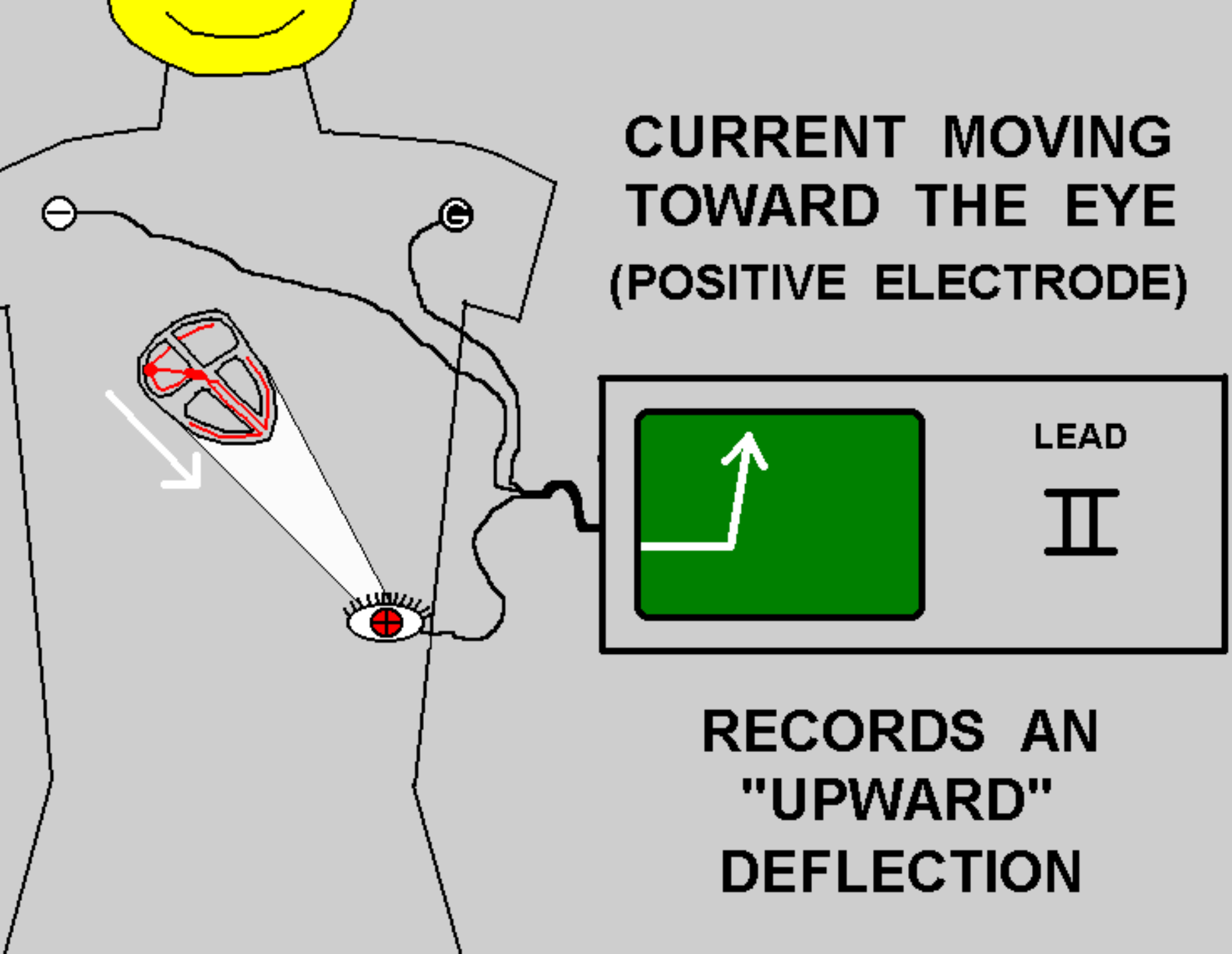
1 POSITIVE ELECTRODE
1 NEGATIVE ELECTRODE
1 GROUND ELECTRODE

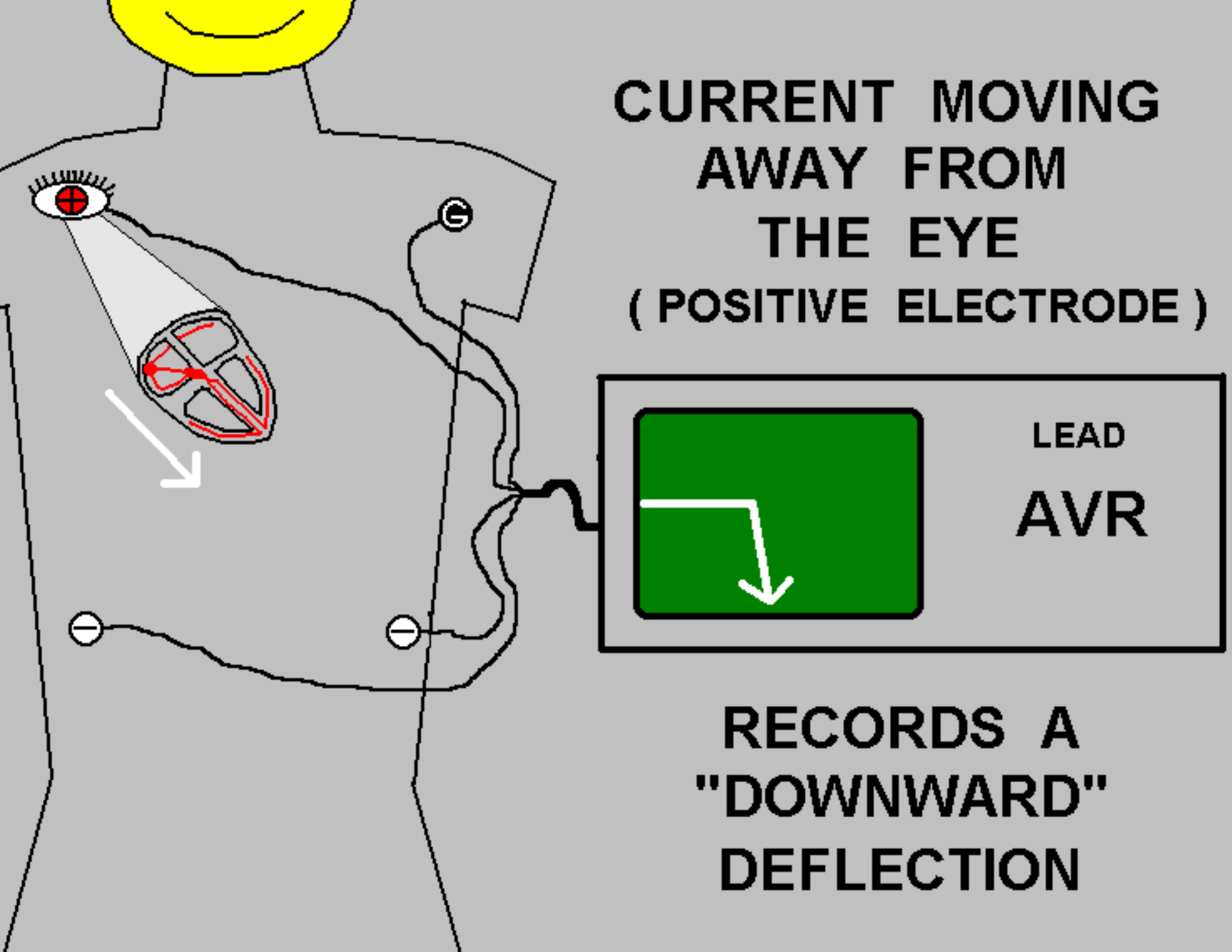


THE POSITIVE ELECTRODE

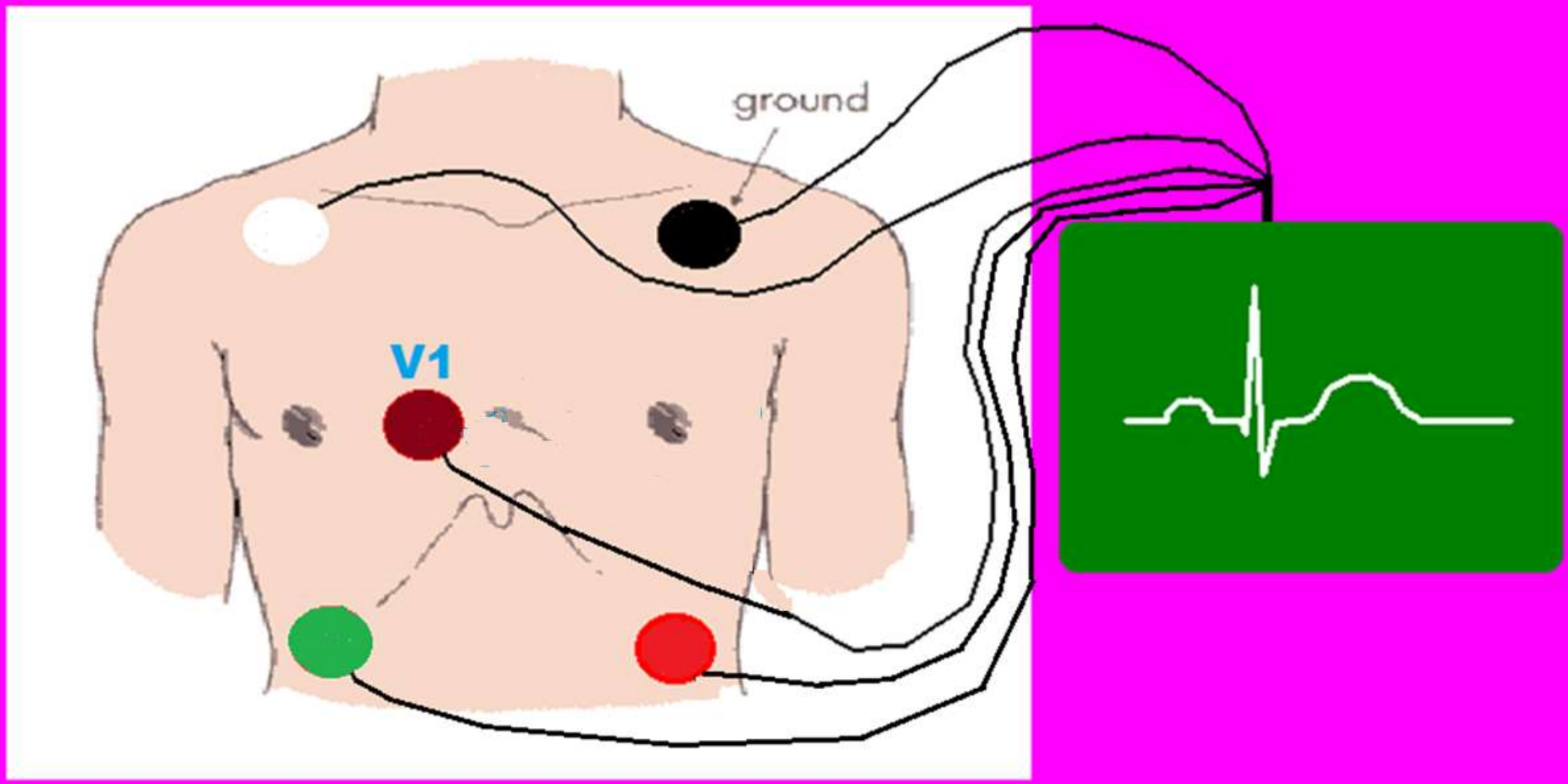


IS THE "EYE" . . .


CURRENT MOVING
TOWARD THE EYE
(POSITIVE ELECTRODE)
LEAD
II
RECORDS AN
"UPWARD"
DEFLECTION

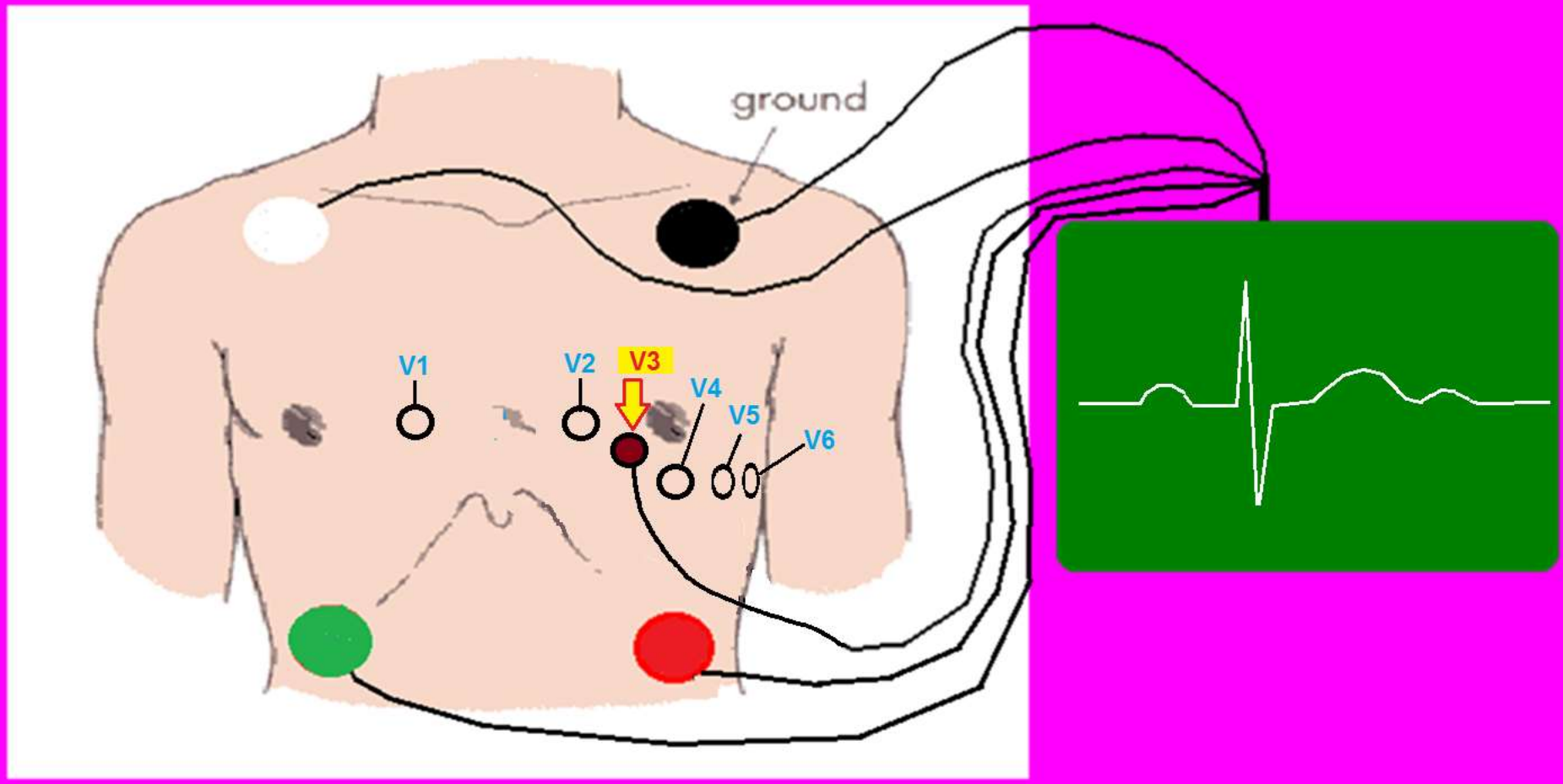

CURRENT MOVING AWAY FROM THE EYE
(POSITIVE ELECTRODE)
LEAD
AVR
RECORDS A "DOWNWARD" DEFLECTION

Traditional Lead Placement



5 WIRE TELEMETRY UNIT

LEAD PLACEMENT - V3



5 WIRE TELEMETRY UNIT

ESTABLISH YOUR ROUTINE ECG EVALUATION.....

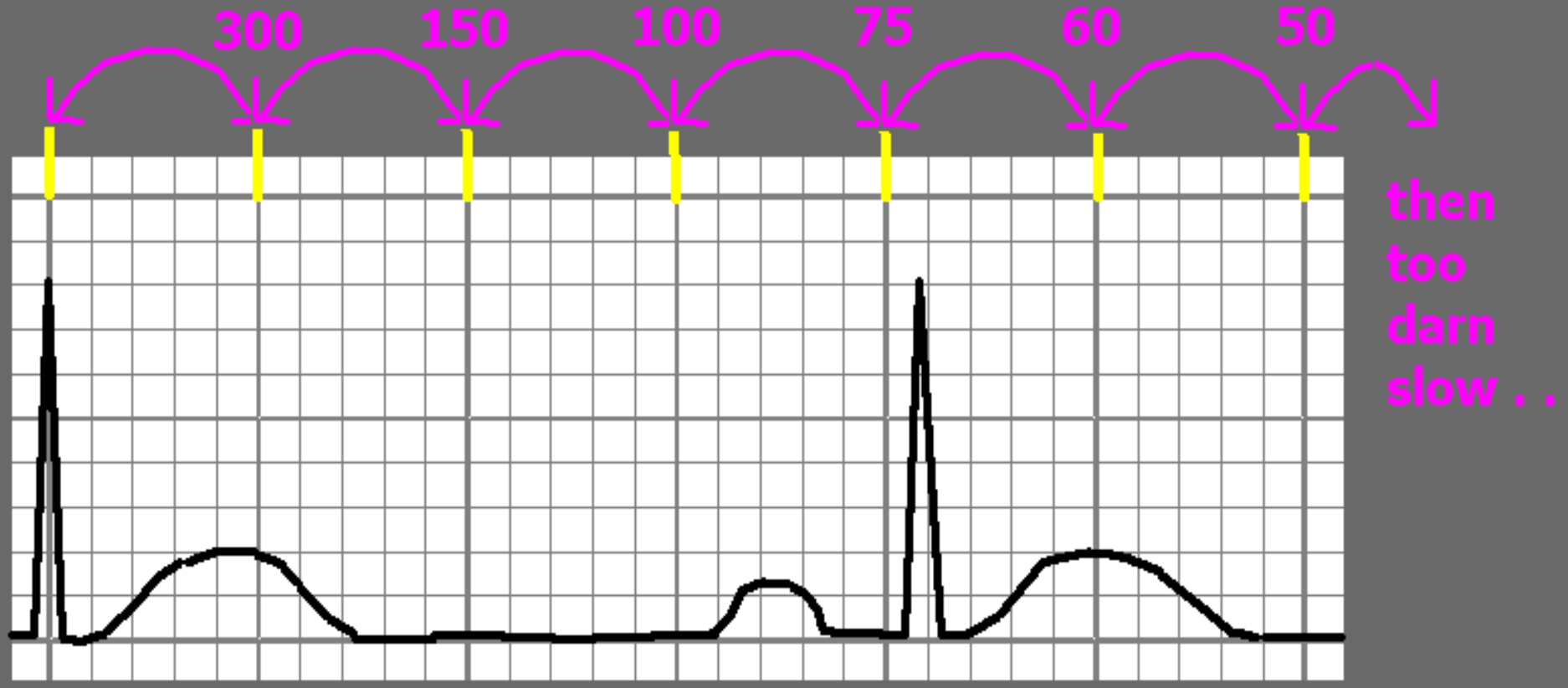
- ☐ RATE
- ☐ RHYTHM
- ☐ INTERVALS
- ☐ P:QRS RATIO

ESTABLISH YOUR ROUTINE ECG EVALUATION.....

- ☐ RATE
- ☐ RHYTHM
- ☐ INTERVALS
- ☐ P:QRS RATIO

DETERMINE HEART RATE

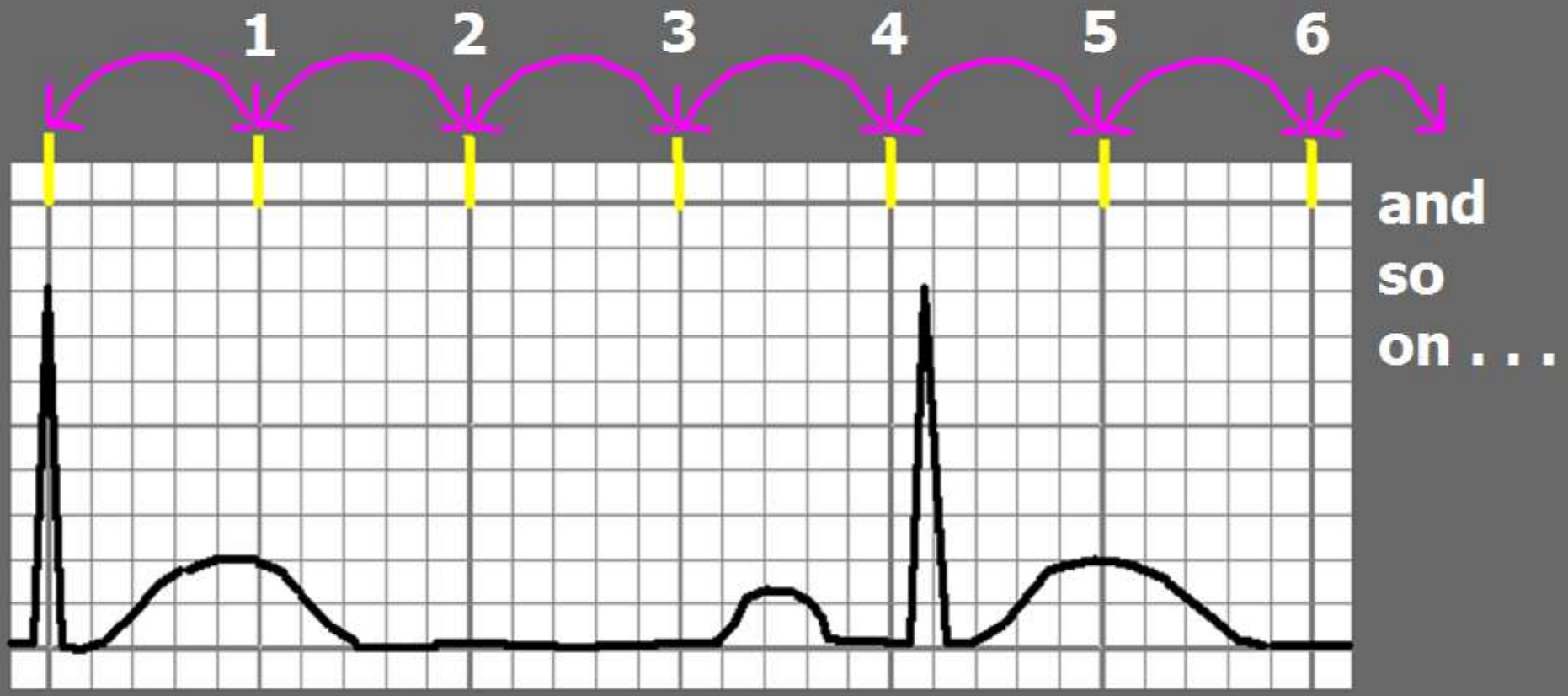
METHOD 1:
(regular rhythm)



DETERMINE HEART RATE

"300 Divided By ____"

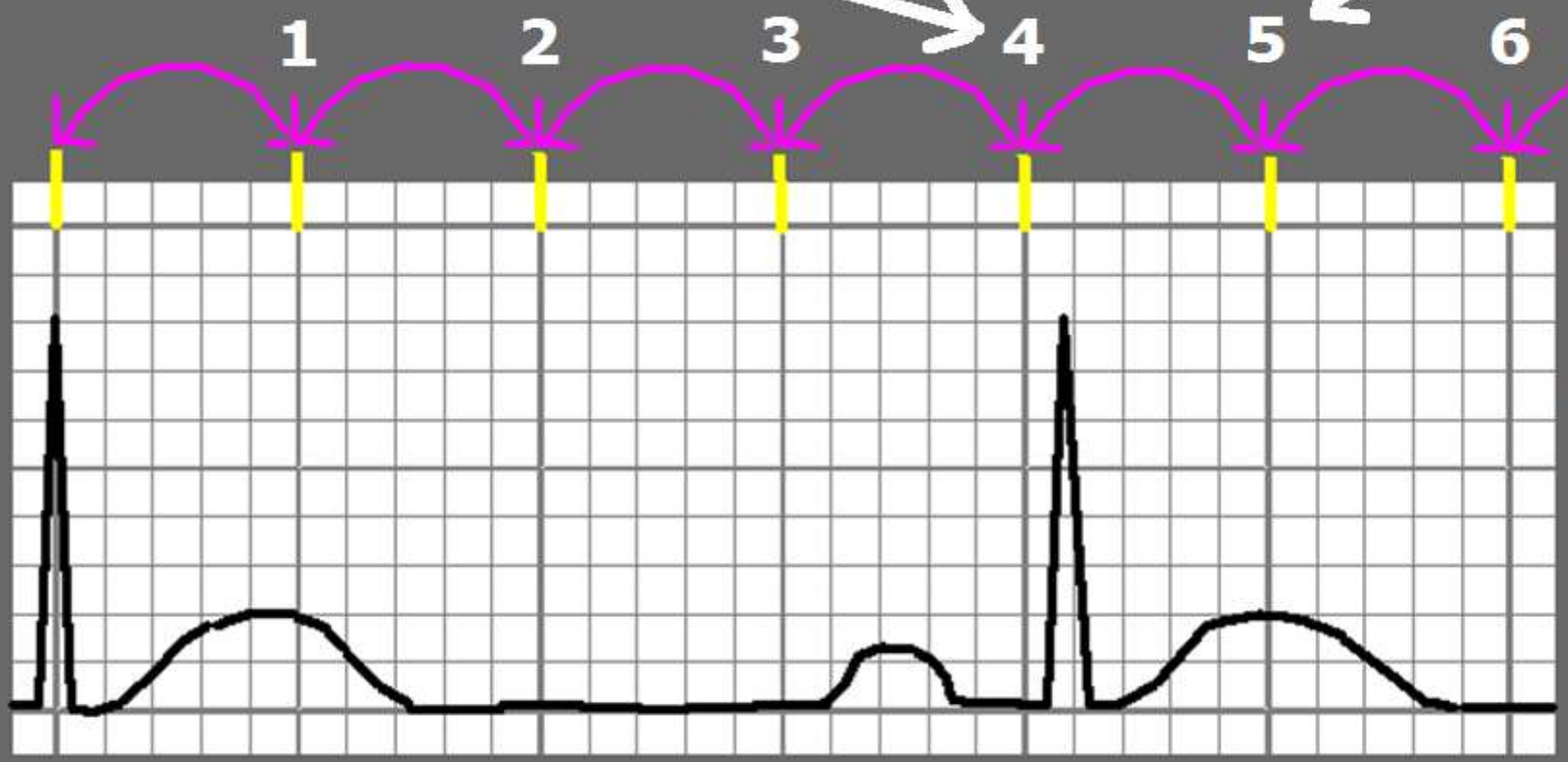
(regular rhythm)



DETERMINE HEART RATE

300 divided by 4 = 75

300 divided by 5 = 60

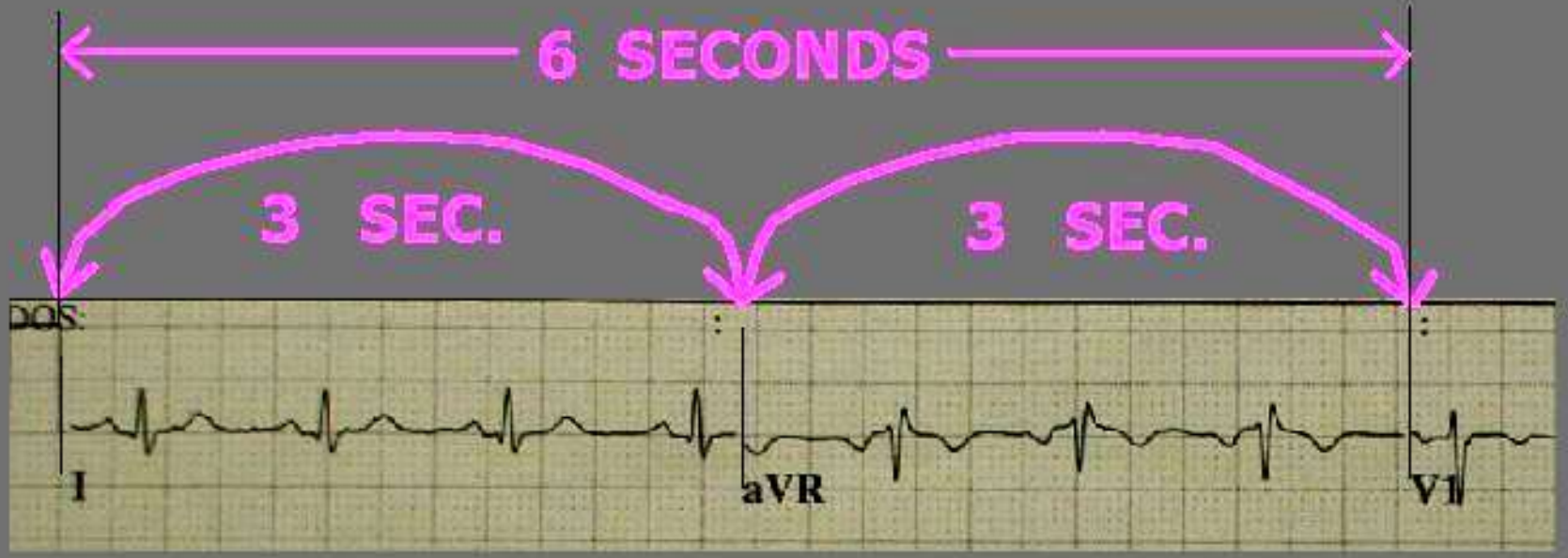


and so on . . .

"so our patient's heart rate is between 75 & 60, closer to 75."

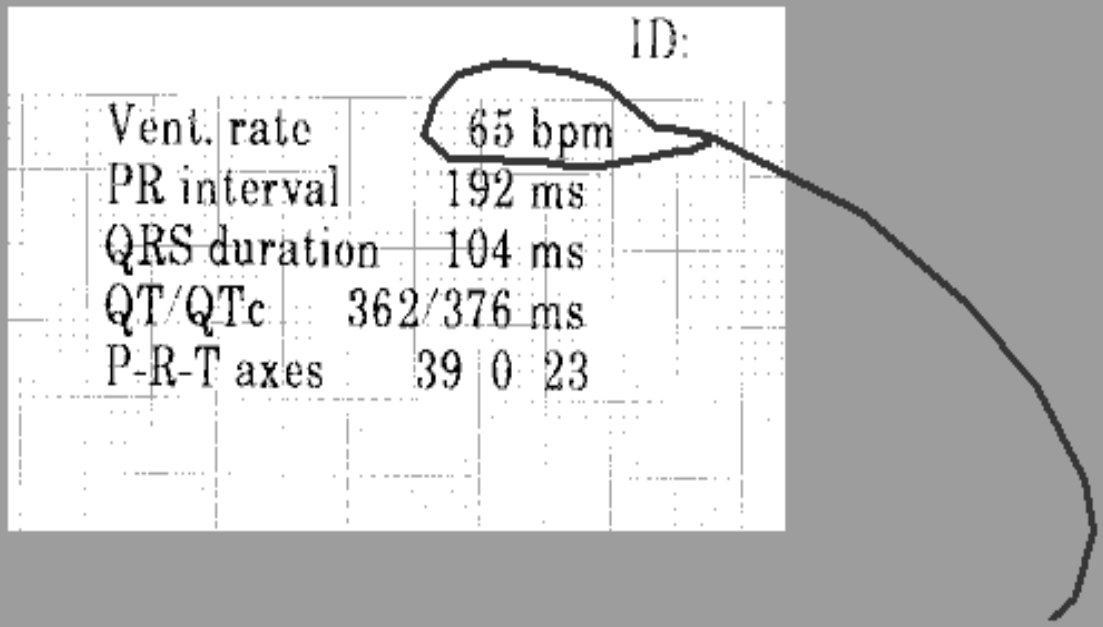
DETERMINE HEART RATE:

METHOD 2:



HR = 70

. . . . OR MAKE IT EASY ON YOURSELF
AND SIMPLY SAY . . . . . .



" HEART RATE IS SIXTY- FIVE ! "

THE CONCERNS OF ACLS

IS THE

VENTRICULAR RATE :

THE CONCERNS OF ACLS

IS THE

VENTRICULAR RATE :

- TOO SLOW

THE CONCERNS OF ACLS

IS THE

VENTRICULAR RATE :

- TOO SLOW
- TOO FAST

THE CONCERNS OF ACLS

IS THE

VENTRICULAR RATE :

- TOO SLOW
- TOO FAST
- JUST RIGHT.

"There is NO SUCH thing as an EP (heart rate) emergency . . .

If the rate's too slow -- PACE IT

If the rate's too fast -- SHOCK IT !"

Dr. James Irwin
Electrophysiologist
St. Joseph's Hospital
Tampa, Florida

HEART RATES THAT ARE:

BELOW 50 **ARE TOO SLOW AND MAY CAUSE PATIENT TO BE UNSTABLE**

50 – 150 **JUST RIGHT ! SHOULD NOT CAUSE PATIENT TO BE UNSTABLE**

ABOVE 150 **ARE TOO FAST AND MAY CAUSE PATIENT TO BE UNSTABLE**

-- CRITICAL ECG ALERT --

-Immediately check patient
-Notify next “higher up” in chain of command

1. Heart rate LESS THAN 50 or GREATER THAN 150

HEART RATE CLASSIFICATIONS

Heart rates that are:	CLASSIFIED AS:
Below 60	BRADYCARDIA
60 - 100	NORMAL
Above 100	TACHYCARDIA

ACLS TACHYCARDIA GUIDELINES

150

100

SVT

SINUS TACH

NSR

ESTABLISH YOUR ROUTINE ECG EVALUATION.....

- [x] RATE
- [ ] RHYTHM
- [ ] INTERVALS
- [ ] P:QRS RATIO

DETERMINE RHYTHM

" WHEN YOUR R - R INTERVALS . . . "

REGULAR

" ARE ALWAYS CONSISTENT "

REGULARLY IRREGULAR

" FOLLOW A PATTERN "

IRREGULARLY IRREGULAR

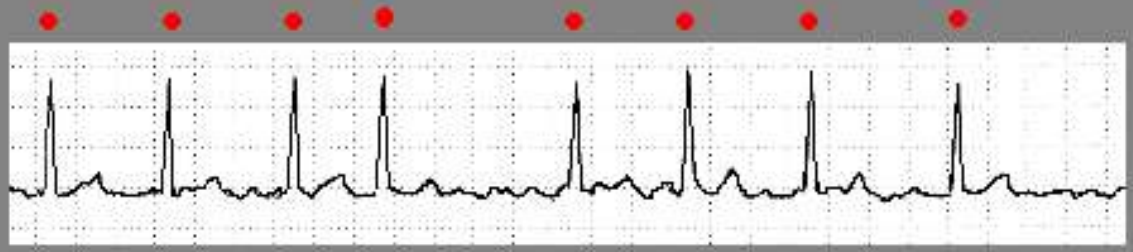
" ARE TOTALLY CHAOTIC "

DETERMINE RHYTHM

REGULAR

REGULARLY IRREGULAR

IRREGULARLY IRREGULAR



DETERMINE RHYTHM

EXAMPLES:

REGULAR

- SINUS RHYTHM
- JUNCTIONAL RHYTHM
- VENTRICULAR RHYTHMS

REGULARLY IRREGULAR

- WENCKEBACH (2nd Degree Type I HB)
- BIGEMINY, TRIGEMINY, etc

IRREGULARLY IRREGULAR

- ATRIAL FIBRILLATION
- MULTIFOCAL ATRIAL RHYTHMS

ESTABLISH YOUR ROUTINE ECG EVALUATION.....

- [x] RATE
- [x] RHYTHM
- [ ] INTERVALS
- [ ] P:QRS RATIO

NORMAL P-R INTERVAL

- .12 - .20 sec.
  or
  120 - 200 mSEC.

- MUST BE **CONSISTENT**
  FROM BEAT
  TO BEAT !!

P - R INTERVAL TOO SHORT . . .

LESS THAN 120 mSEC

THINK:

- ECTOPIC ATRIAL ACTIVITY
- PRE-EXCITATION (WPW)
- JUNCTIONAL (nearly on top of QRS, possibly inverted)

P - R INTERVAL TOO LONG

GREATER THAN 200 mSEC

THINK:

- HEART BLOCK

P - R INTERVAL INCONSISTENT
(VARIES FROM BEAT TO BEAT)

THINK:

- 2° TYPE 1 HEART BLOCK
  (WENKEBACH)

- 3° HEART BLOCK
  (COMPLETE HEART BLOCK)

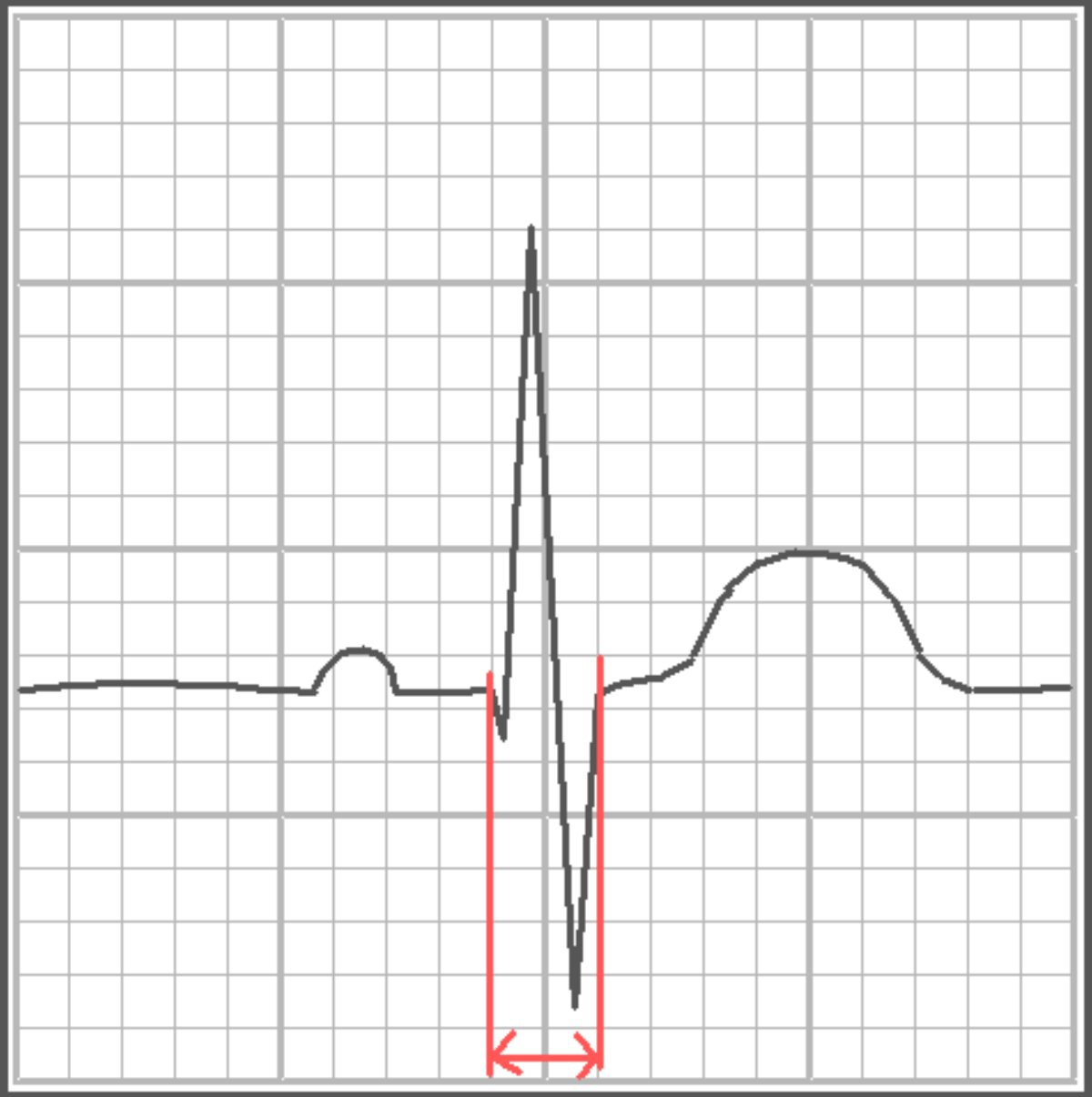
QRS INTERVAL

LESS THAN

.12

OR

120 mSEC



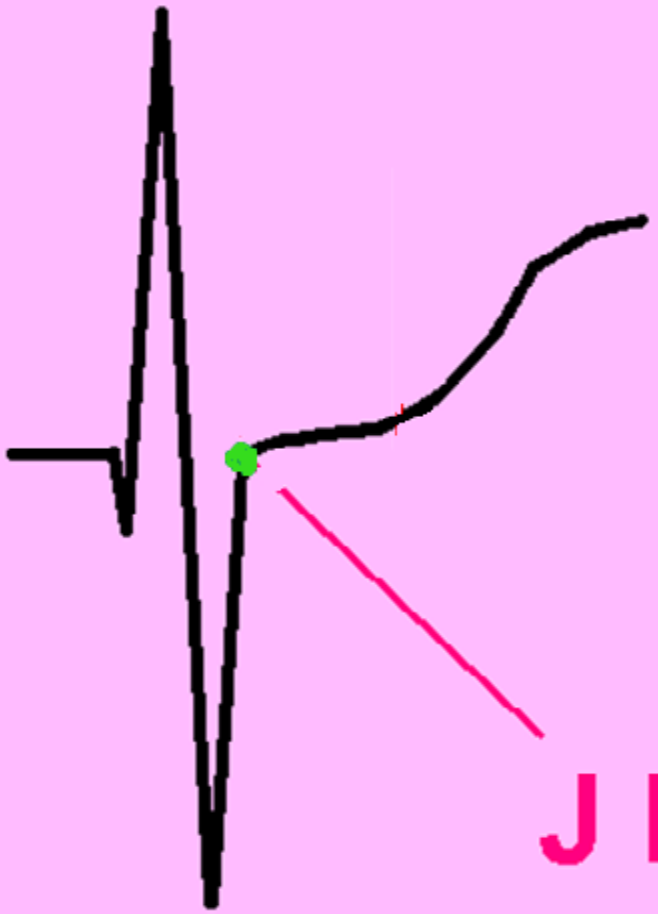
QRS COMPLEX TOO WIDE

WIDER THAN 120 mSEC

THINK:

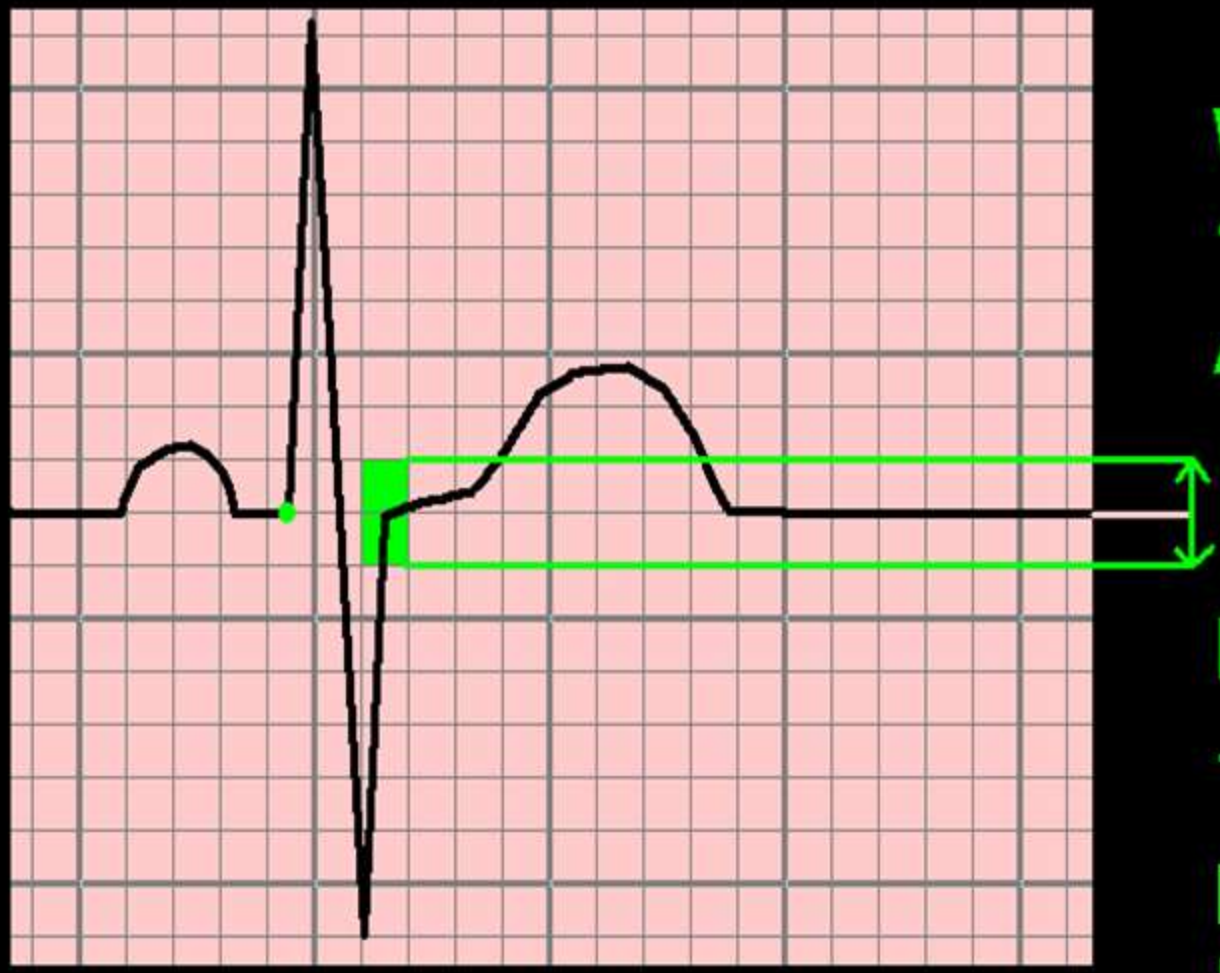
- BUNDLE BRANCH BLOCK
- VENTRICULAR COMPEX (ES)
- PACED RHYTHM
- L VENTRICULAR HYPERTROPHY
- ELECTROLYTE IMBAL. ($\uparrow K^{+}$ $\downarrow Ca^{++}$)
- DELTA WAVE (PRE-EXCITATION)

THE J POINT



is where the QRS complex ends and the S-T Segment begins.

THE J POINT SHOULD BE . .



WITHIN
1 mm
ABOVE

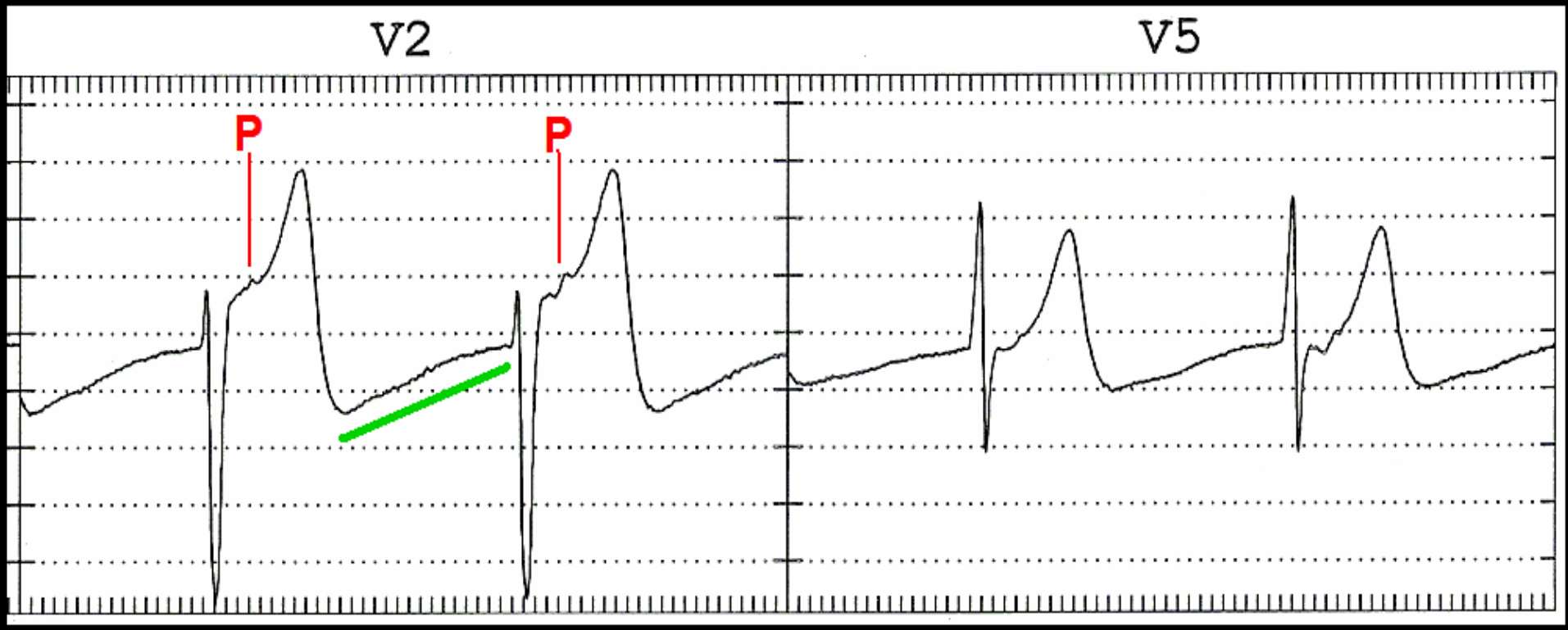
OR

BELOW
the
ISOELECTRIC
LINE

or the P-Q JUNCTION.

THE ISOELECTRIC LINE

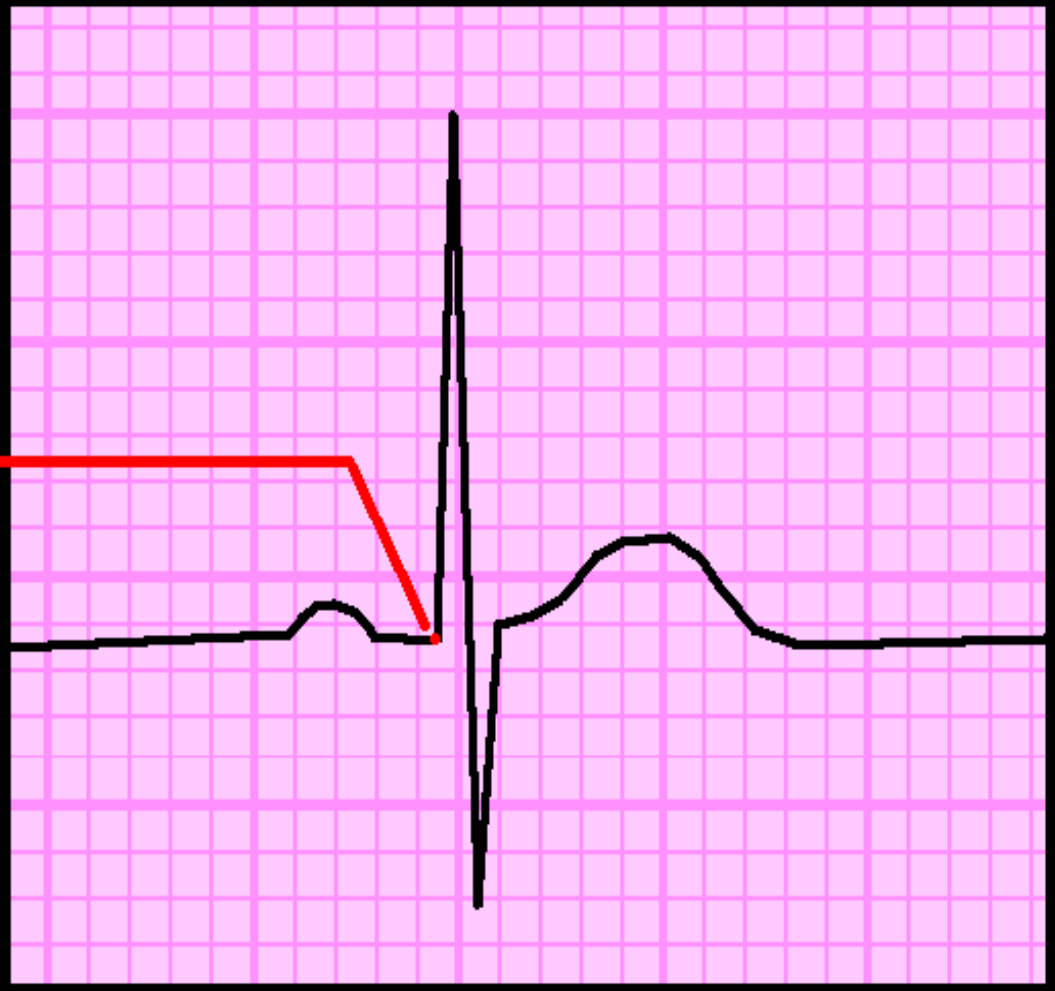
EKG from 13 y/o girl in ACCELERATED JUNCTIONAL RHYTHM.
note: upsloping T-P interval, and P buried in T waves.



THE P-Q JUNCTION

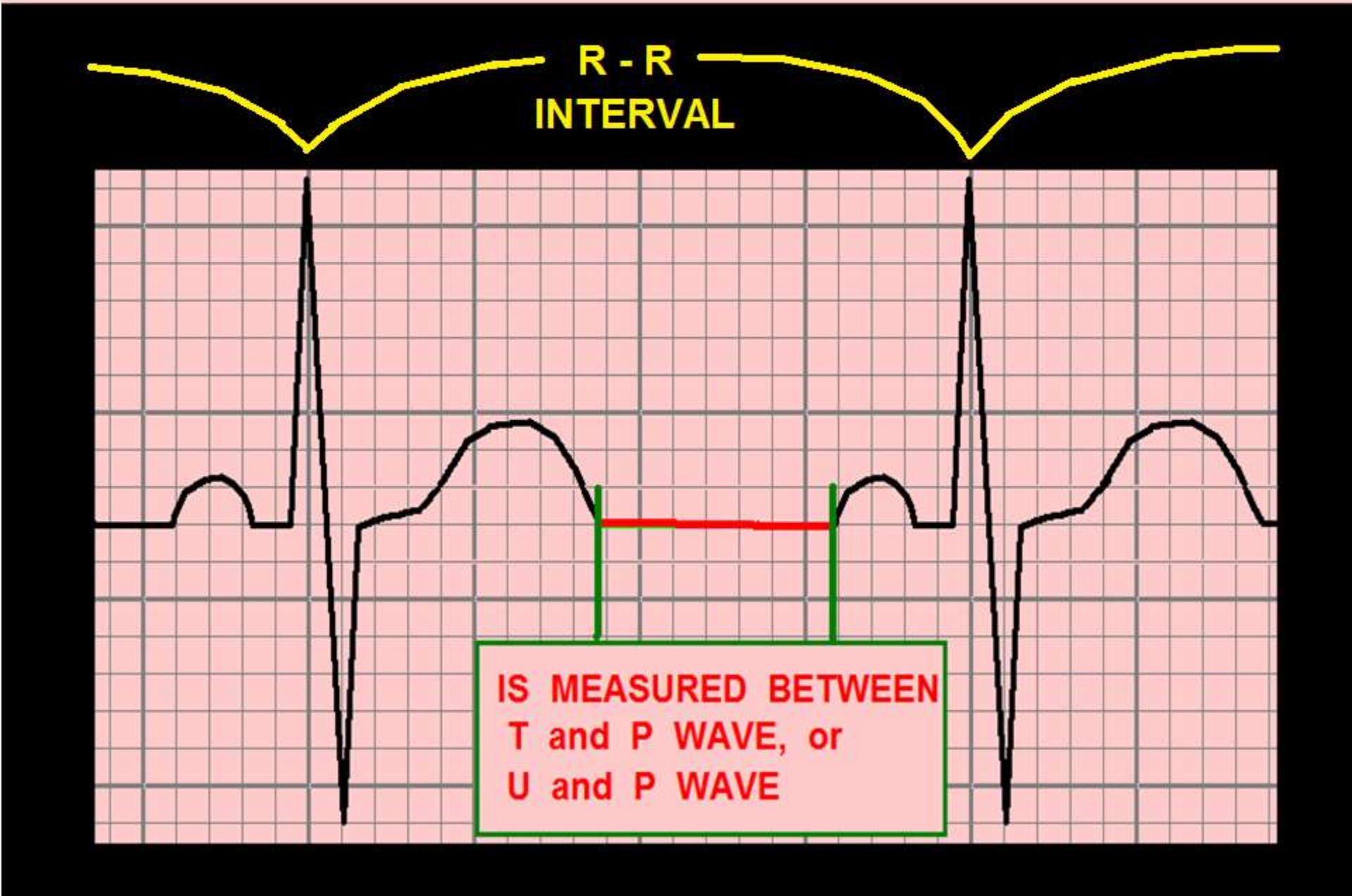
. . . is the POINT where the P-R SEGMENT ends and the QRS COMPLEX BEGINS.

Used for POINT OF REFERENCE for measurement of the J-POINT and the S-T SEGMENT –

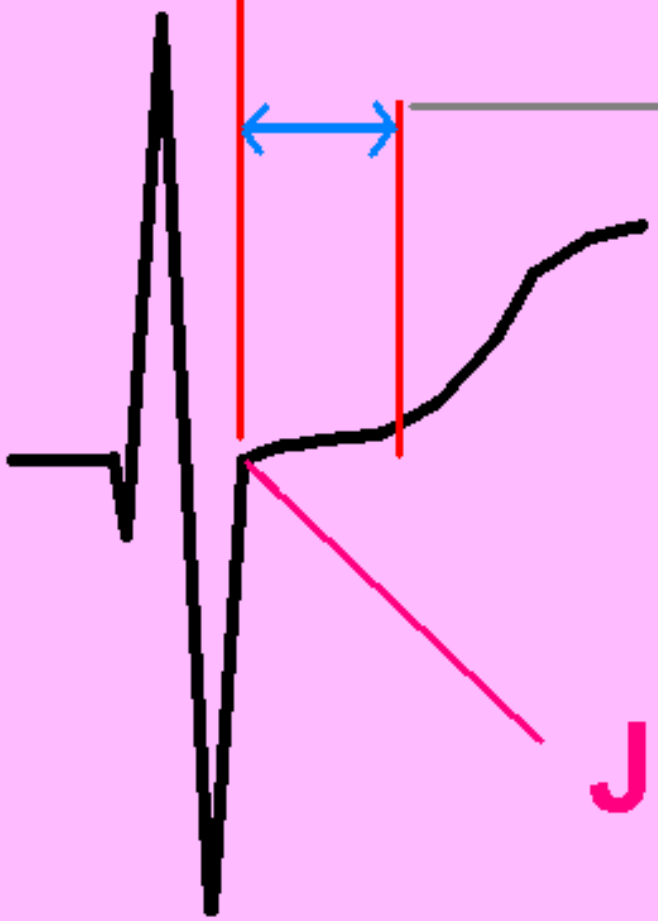


— as per the A.H.A., A.C.C., and WANG, ASINGER, and MARRIOTT, N.E.J.M. vol. 349:2128-2135 Nov. 27, 2003

THE ISOELECTRIC LINE



THE S-T SEGMENT



BEGINS AT J POINT

ENDS AT BEGINNING OF T WAVE

J POINT

Q - T INTERVAL

- VARIES BASED ON HEART RATE AND SEX

THE *QTc INTERVAL

*QTc = Q-T interval, *corrected* for heart rate

HEART RATE	MALE	FEMALE
150	0.25	0.28
125	0.26	0.29
100	0.31	0.34
93	0.32	0.35
83	0.34	0.37
71	0.37	0.40
60	0.40	0.44
50	0.44	0.48
43	0.47	0.51

Annals of Internal Medicine, 1988 109:905.

Determining the QTc

Manual calculation:

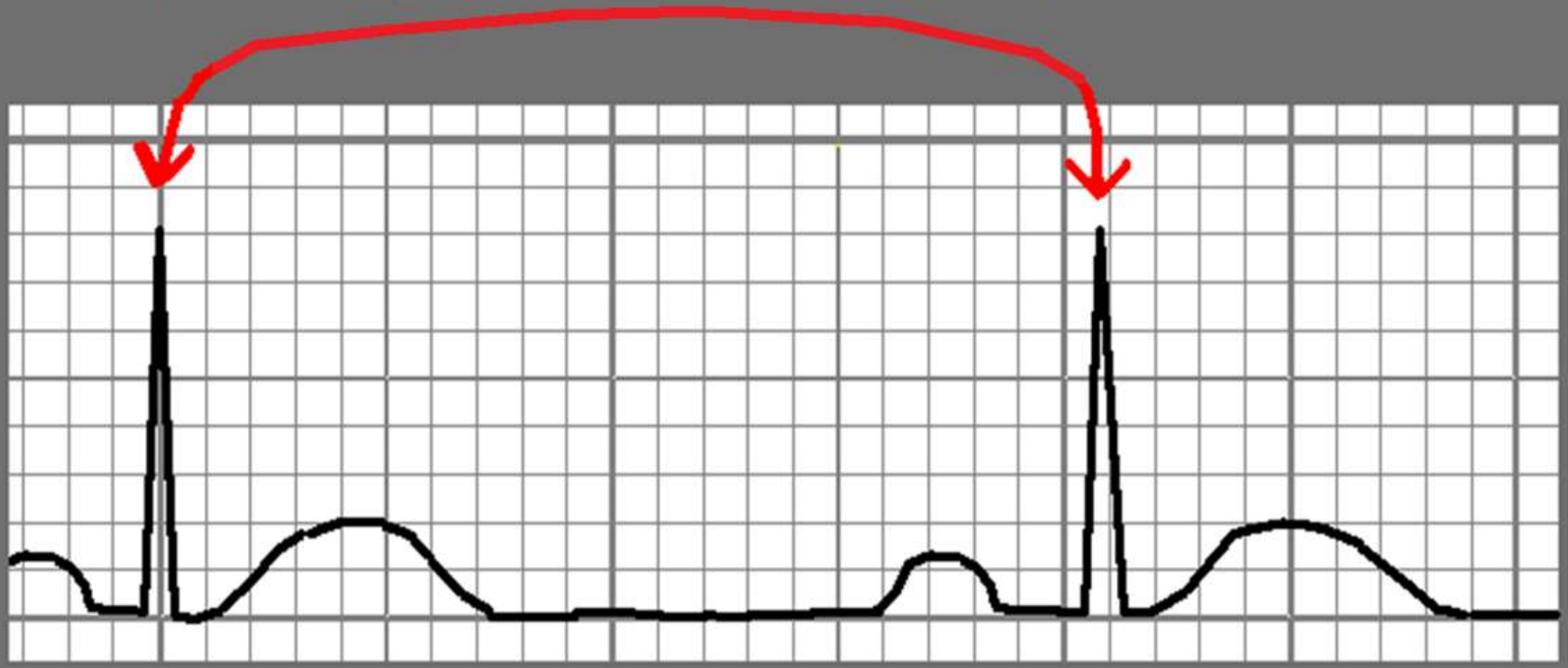
QT CORRECTION FORMULAS:

Bazett's	$QTc=QT/\sqrt{RR}$
Fredericia	$QTc=QT/(RR)1/3$
Framingham	$QTc=QT+0.154(1-RR)$
Rautaharju	$QTp=656/(1+HR/100)$

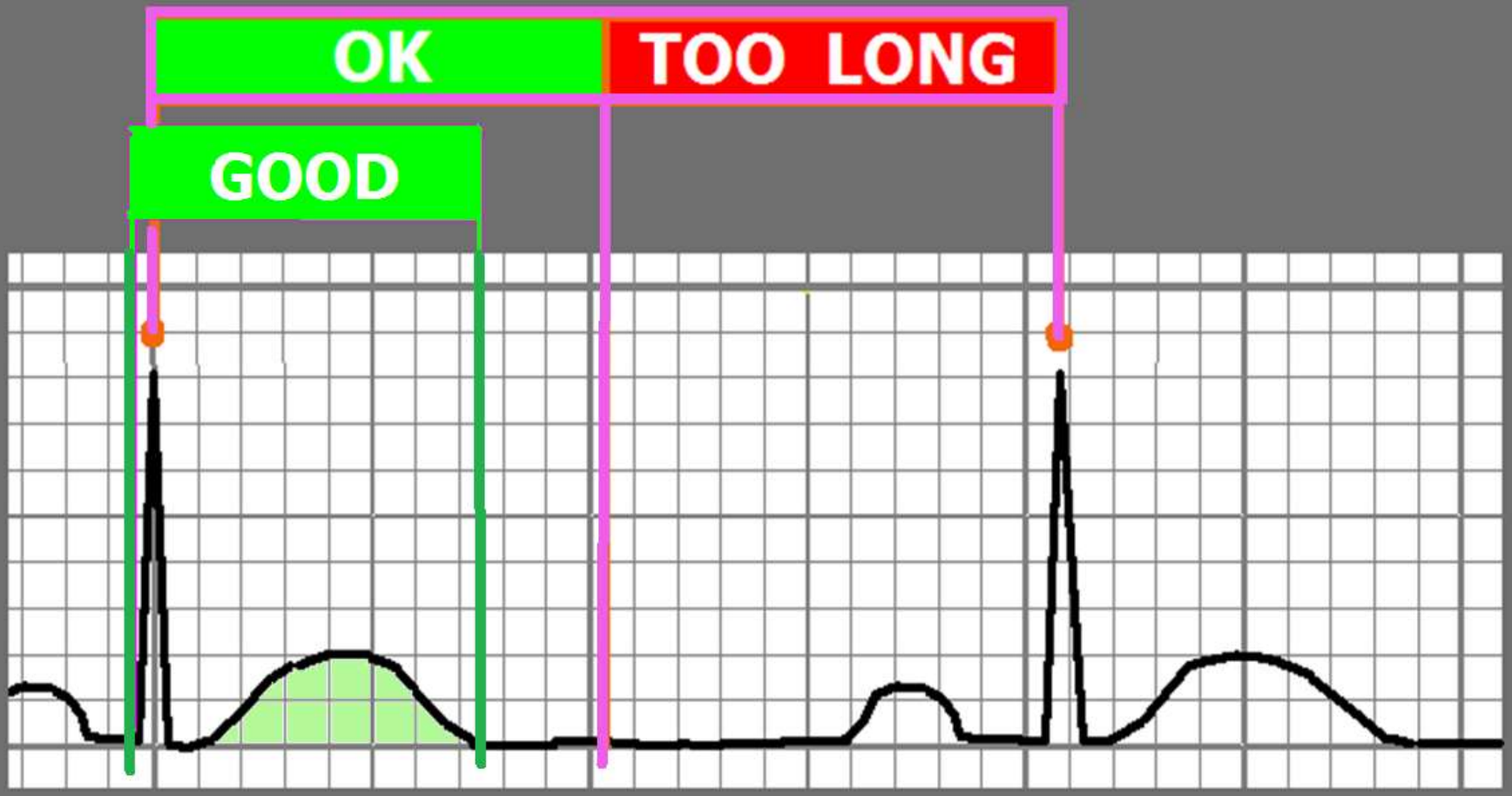
DETERMINING Q-T INTERVAL LIMITS

THE "QUICK PEEK" METHOD

- Relatively accurate method to quickly identify patients with abnormal QT Intervals.
  - Applies to patients with normal heart rates (60-100) and narrow QRS (QRSd <120ms)



The Q - T Interval should be LESS THAN 1/2 the R - R Interval



The Q - T Interval should be LESS THAN 1/2 the R - R Interval

Determining the QT / QTc

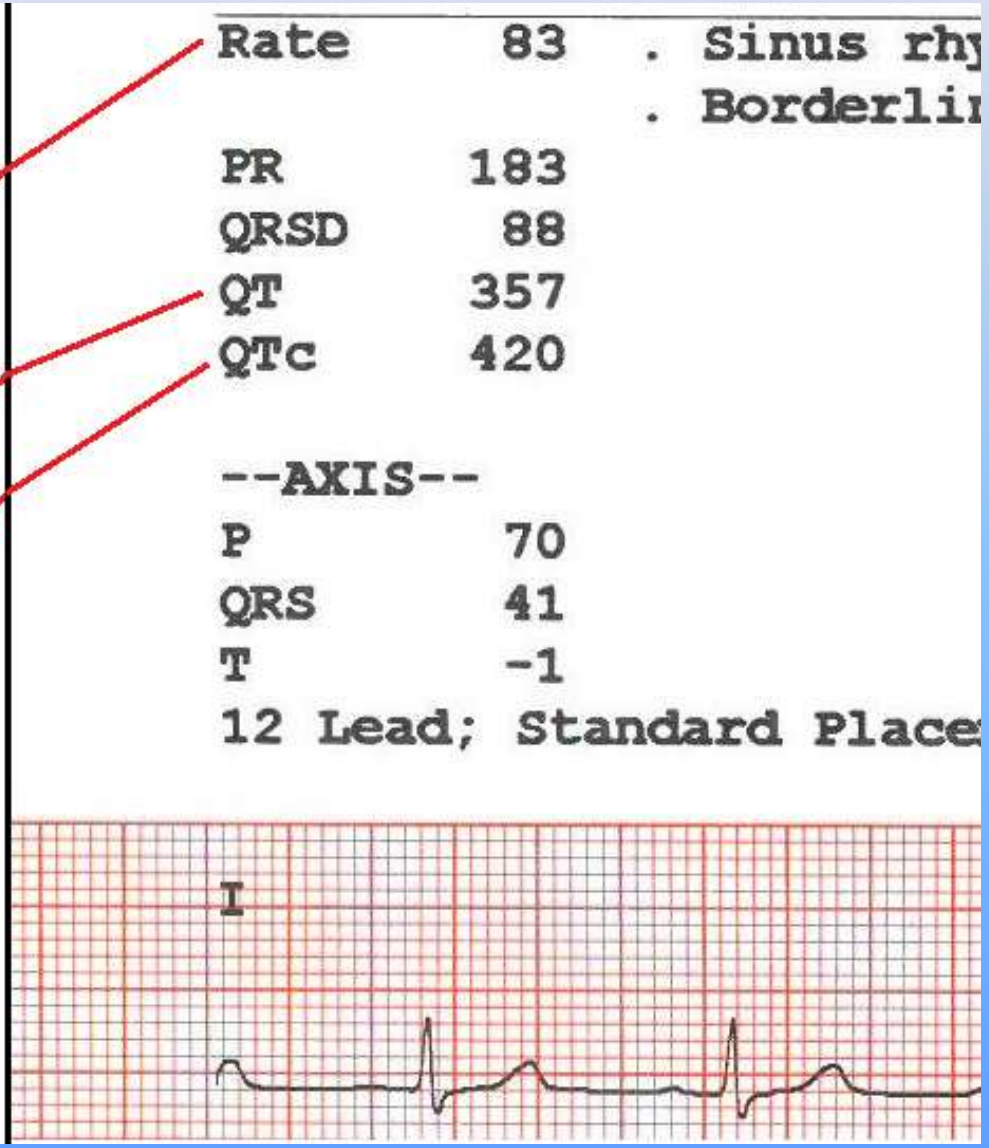
Method 1 – 12 Lead ECG Report:

Standard 12 Lead ECG printout . . .

Heart Rate = 83

QT Interval = 357

QTc = 420

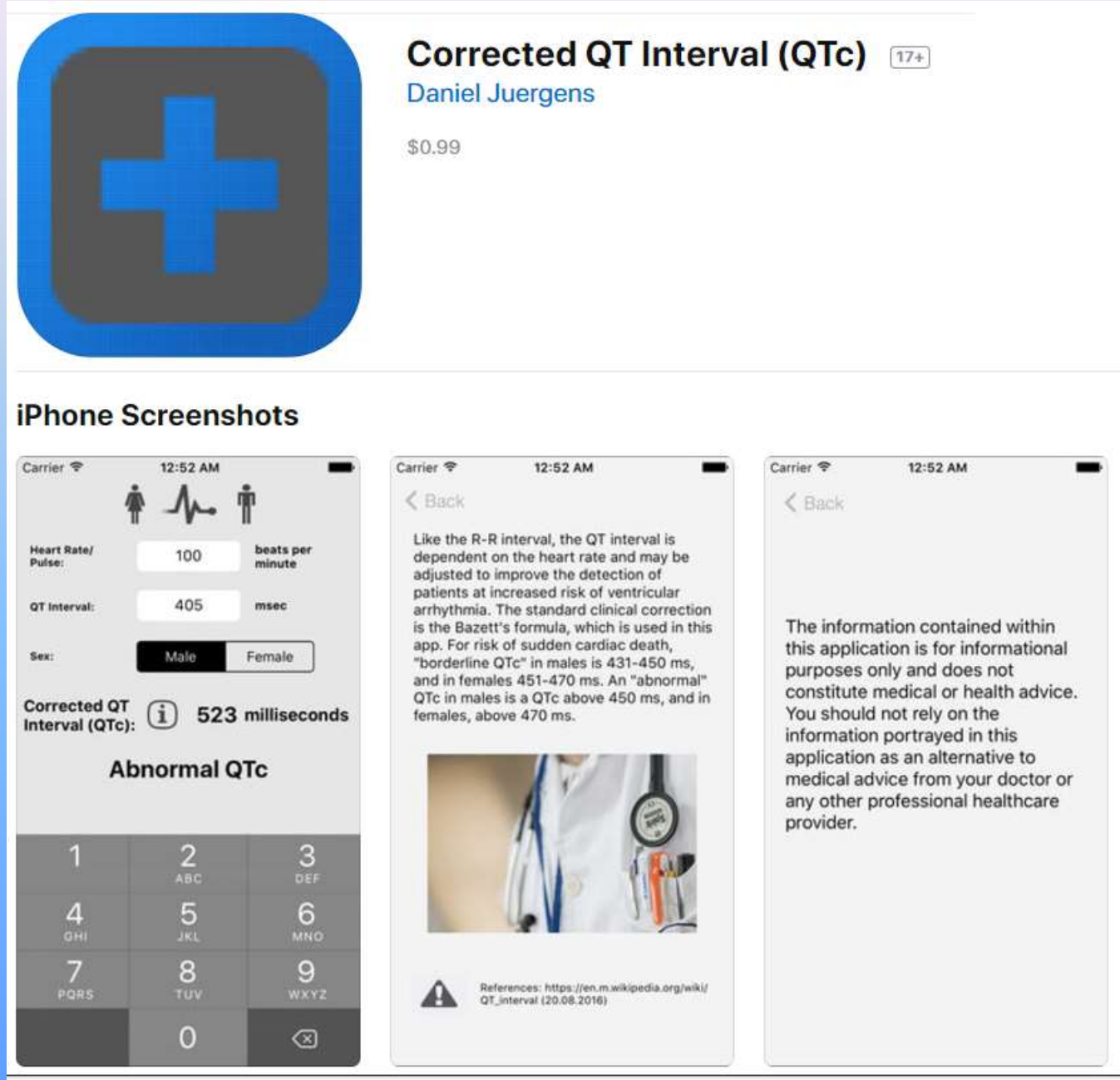


Determining the QTc

Method 4, Use a Smartphone App:

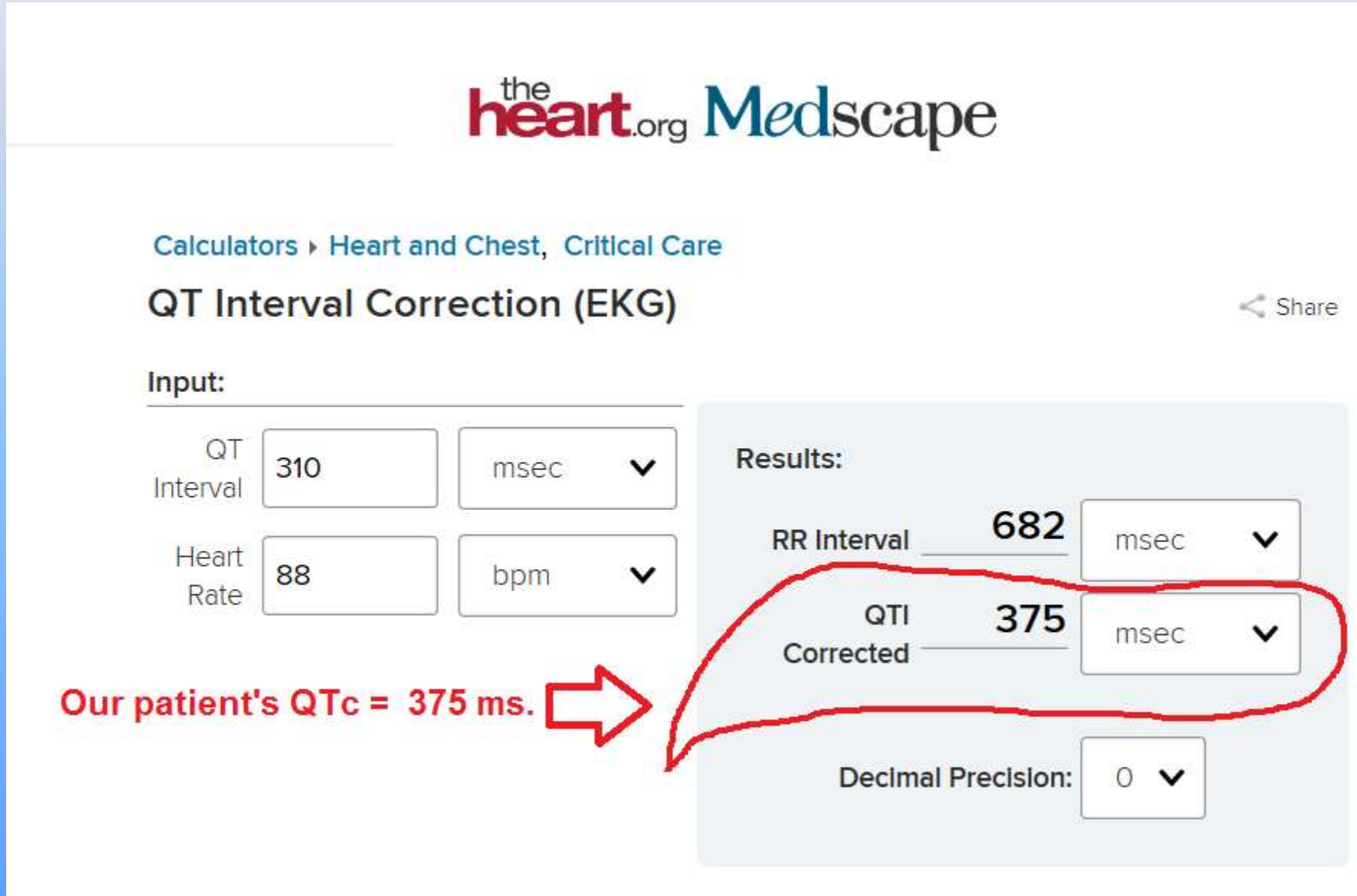
- **iPhone**
  - https://itunes.apple.com/us/app/corrected-qt-interval-qtc/id1146177765?mt=8
- **Android**
  - https://play.google.com/store/apps/details?id=com.medsam.qtccalculator&hl=en

“There’s an APP for that!”



Determining the QTc

Method 3, Use a Web-based App:



QTc Values:

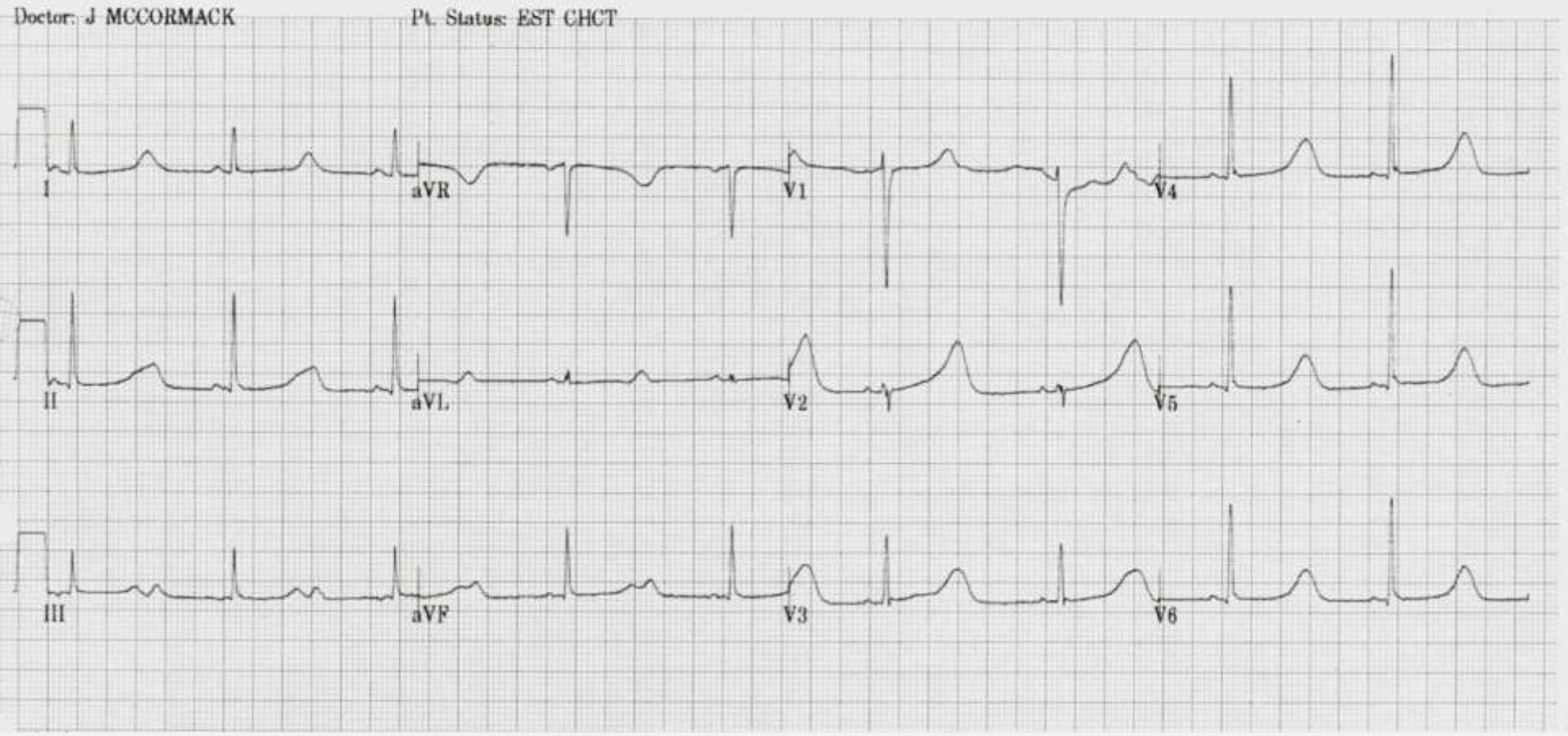
Too Short:	**< 390 ms**
Normal	
-Males:	**390 - 450 ms**
-Females:	**390 - 460 ms**
Borderline High	
-Males:	**450 - 500 ms**
-Females:	**460 - 500 ms**
High (All Genders):	**500 - 600 ms**
Critical High (associated with TdP):	**600 + ms**

SOURCE: "ACC/AHA/HRS Recommendations for Standardization and Interpretation of the ECG, Part IV: The ST Segment, T and U Waves, and the QT Interval" Rautaharju et al 2009

22 y/o FEMALE

Vent. rate	53 bpm
PR interval	110 ms
QRS duration	84 ms
QT/QTc	678/636 ms
P-R-T axes	25 60 48

PEDIATRIC CARDIOLOGY ASSOCIATES



WHEN THE “QUICK PEEK” METHOD for QT INTERAL EVALUATION IS APPLIED TO THE ABOVE ECG, WHAT IS THE RESULT?

Dysrhythmia Associated with Mortality, Triggered by LQTS: *Torsades de Pointes*

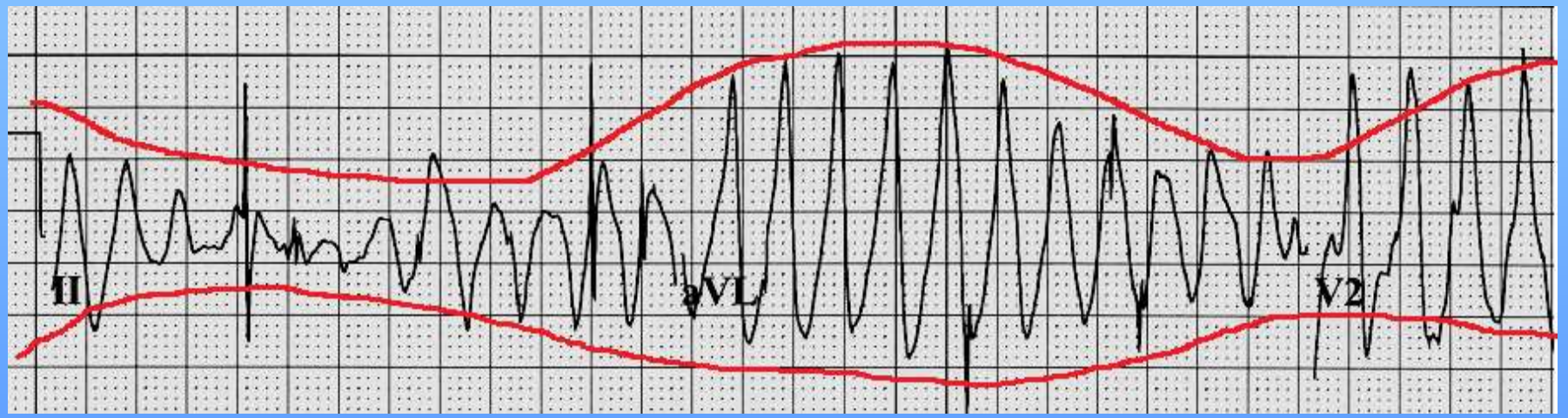
Torsades de Pointes (TdP) – HEMODYNAMICS:

- **Decreased – to – NO Cardiac Output**
- **Often patient PULSELESS during episode**
- **Patients often report SYNCOPE when TdP self-terminates.**
- **May DETERIORATE into VENTRICULAR FIBRILLATION and CARDIAC ARREST. ("Sudden Death")**

ECG Characteristics of TdP: The QRS Pattern of *Torsades de Pointes*

resembles . . . . .

a piece of Twisted Ribbon !



-- CRITICAL ECG ALERT --

-Immediately check patient

-Notify next “higher up” in chain of command

1. Heart rate LESS THAN 50 or GREATER THAN 150
2. QT INTERVAL prolonged (usually not emergent but let Dr. know)

Etiology of Long QT Syndromes:

Congenital (14 known subtypes)

Genetic mutation results in abnormalities of cellular ion channels

Acquired

- Drug Induced
- Metabolic/electrolyte induced
- Very low energy diets / anorexia
- CNS & Autonomic nervous system disorders

Miscellaneous

- Coronary Artery Disease
- Mitral Valve Prolapse

PROLONGED Q-T INTERVAL

THINK:

- CHECK K+ AND MAG LEVELS
- POSSIBILITY OF TORSADES

PROLONGED Q-T INTERVAL

THINK:

- CHECK K+ AND MAG LEVELS
- POSSIBILITY OF TORSADES

- QUESTION MEDS THAT PROLONG Q-T

QT Prolongation -- *STAT Intervention:*

☞ ***Avoidance of Meds that are known to prolong the QT Interval. Click here for current list from CREDIBLEMEDS.ORG***

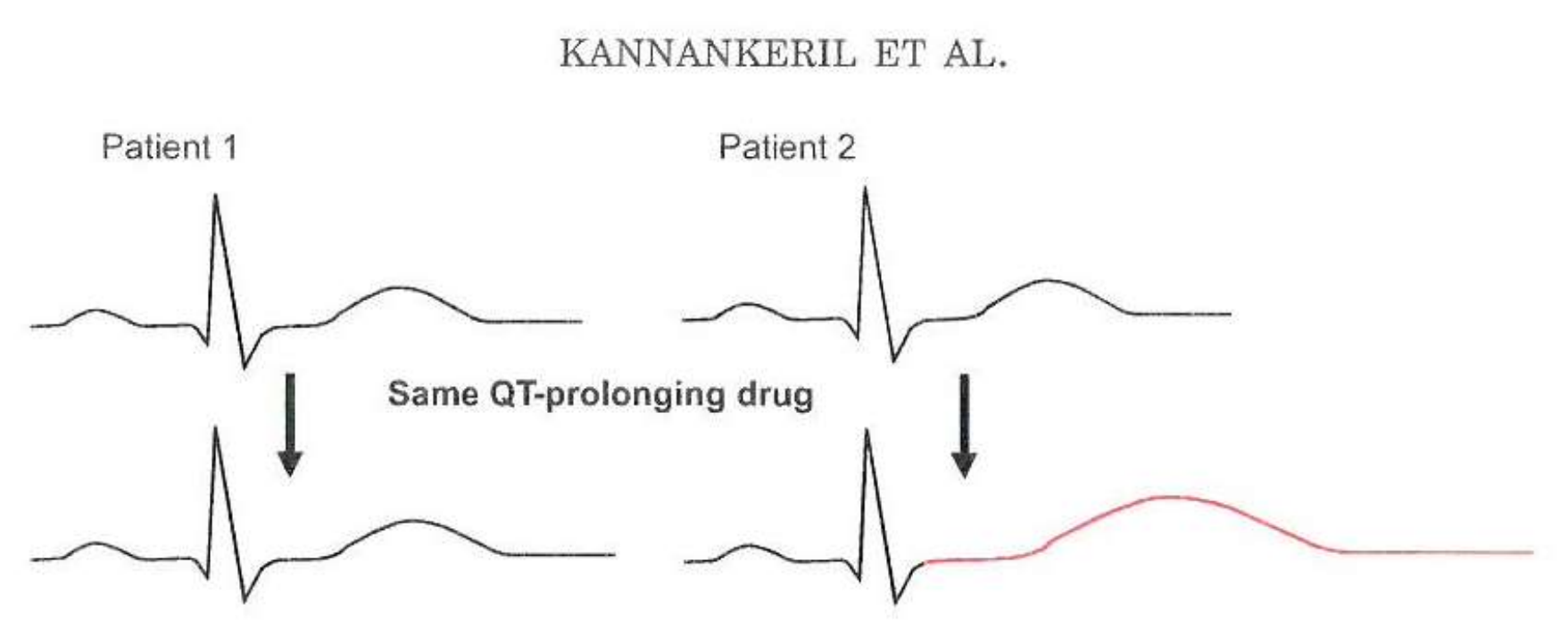
Commonly used QT prolonging meds include:

-Amiodarone
-Procainamide
-Levaquin
-Erythromycin
-Norpace
-Tequin
-Benadryl
-Ritalin
-Pseudophedrine
-Haloperidol
-Thorazine
-Propulcid
-Zofran
-Ilbutilide

and MANY more!

PATIENT 1: NORMAL

PATIENT 2: Genetic susceptibility; sensitivity to QT prolonging drugs:



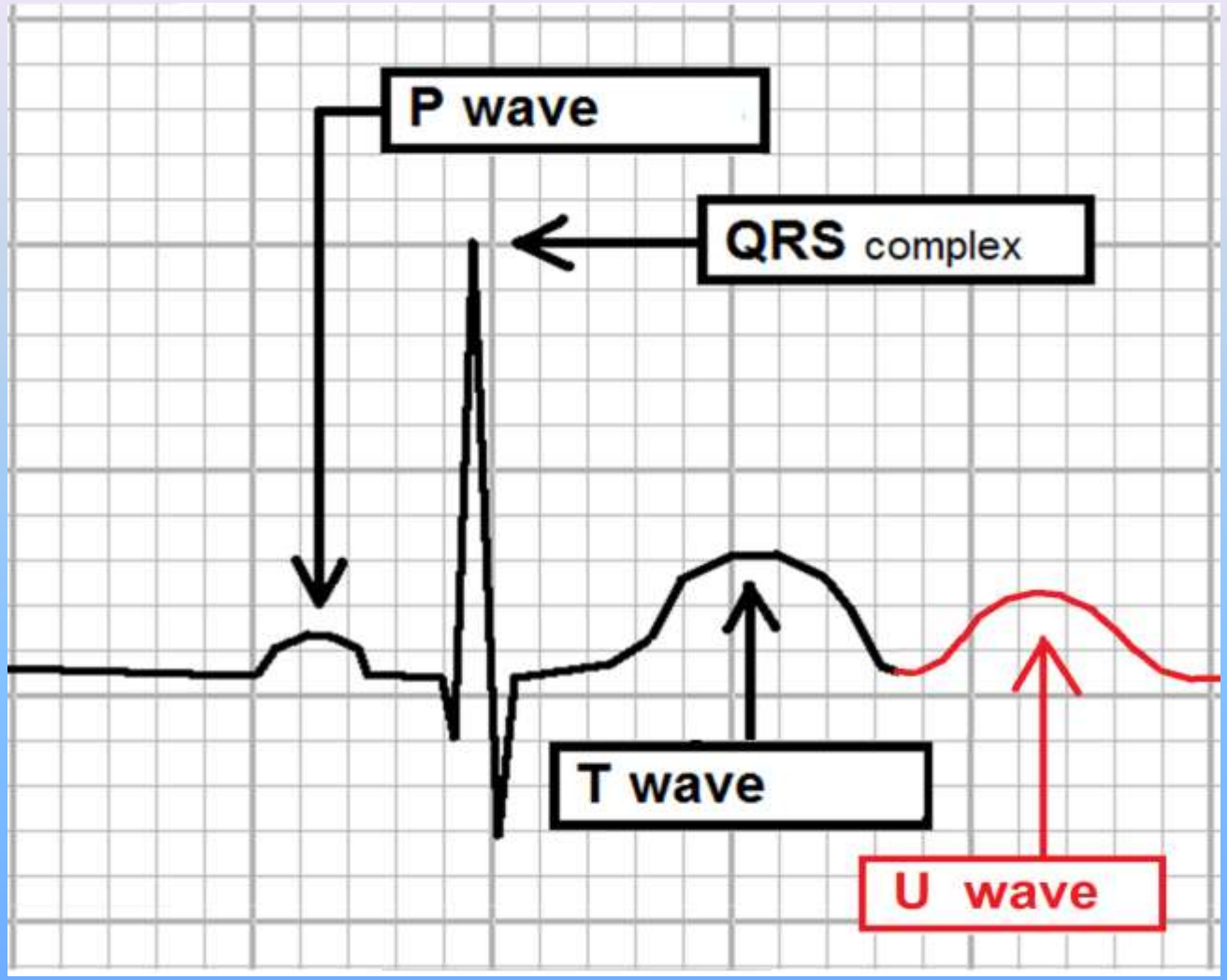
Click here for link to paper by Kannankeril et al (2010 Pharmacological Reviews) that describes genetic susceptibility described above.

U Waves

Occasionally an extra wave is noted after each T wave.

It typically resembles

"a secondary T wave."



When present on the ECG, this "extra" waveform is referred to as a " U Wave."

U Waves . . .

- Common U wave Etiology:
  - **Hypomagnesemia***
  - **Hypokalemia***
  - **Hypocalcemia***
  - **QT prolonging medications***
  - **Increased intracranial pressure***
  - **Hypothermia***
  - **Digitalis** (usually *shortens* the QT Interval)

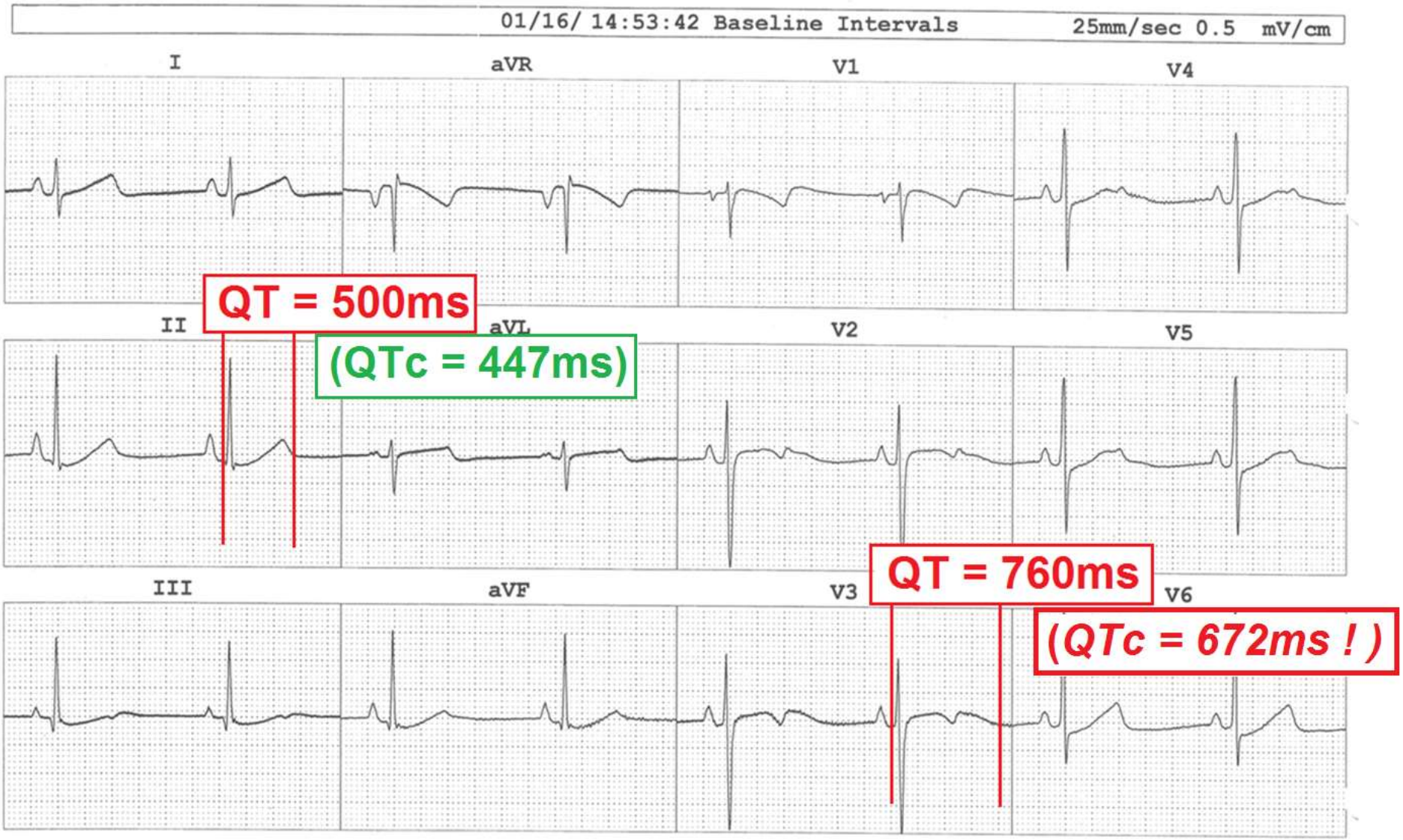
**** These are also causes of QT interval prolongation.***

Abnormal U Waves

INCLUDE the U Wave in the QT Interval measurement **when any one or more criteria are present:**

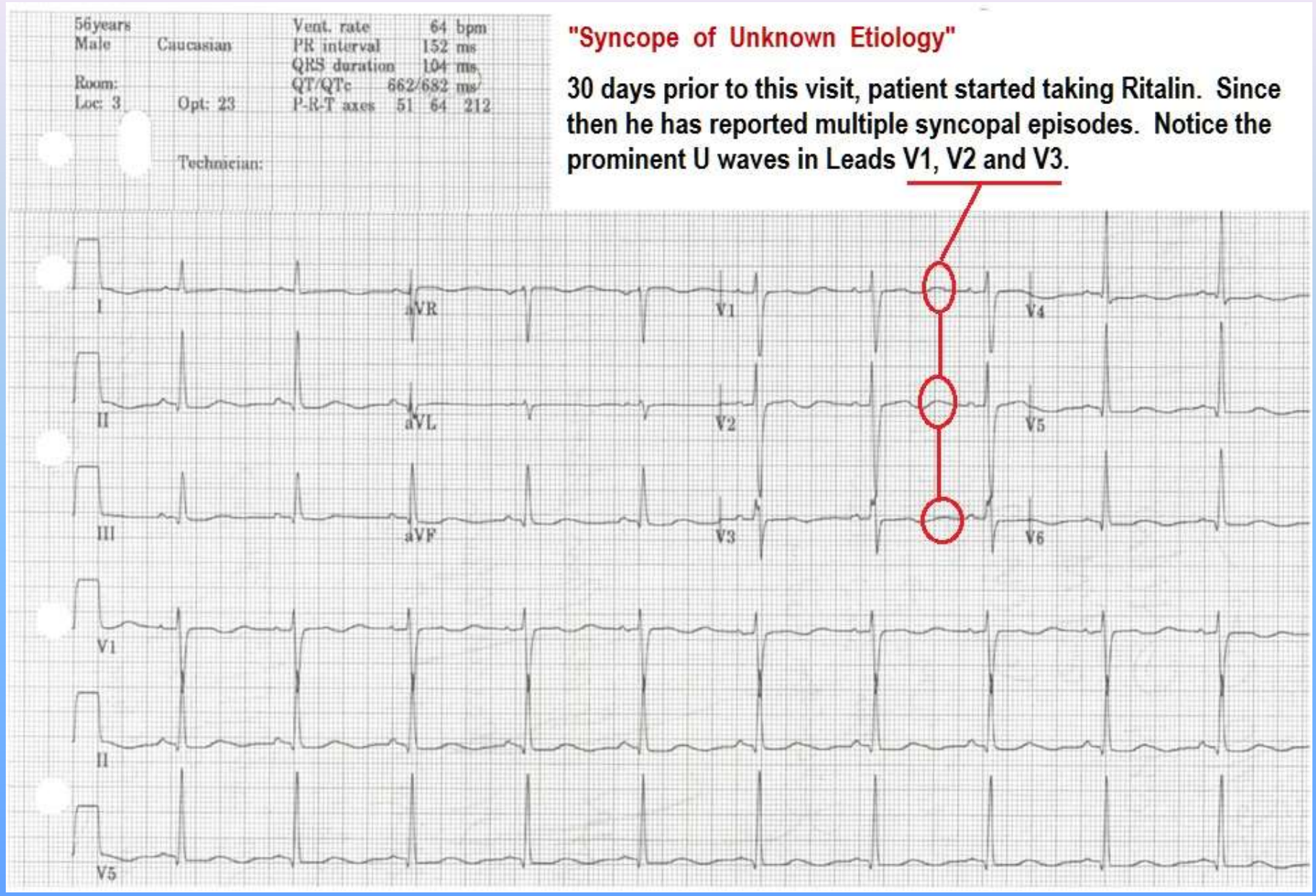
- **U wave 100% (or more) the size of the T wave.**
- **U wave is INVERTED (opposite polarity of T wave)**
- **U wave merged with the T wave**

EVIDENCE SOURCE:
ACC/AHA/HRS Recommendations for the Standardization and Interpretation of the Electrocardiogram Part IV: The ST Segment, T and U Waves, and the QT Interval.

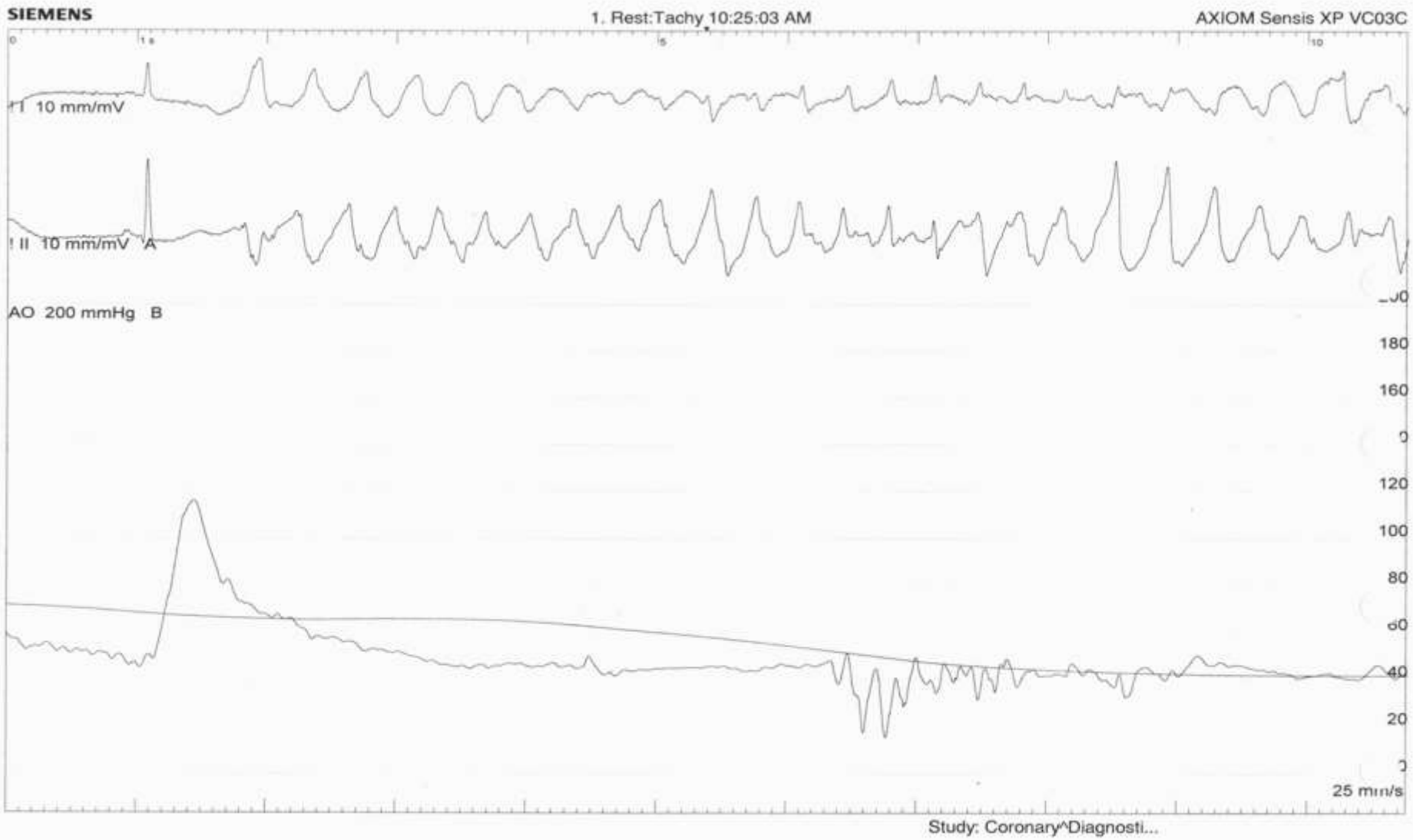


This ECG illustrates the degree of variation that can be noted between different leads on the 12 Lead ECG. ALWAY measure the QT Interval in the lead with the GREATEST value.

Medication induced LQTS with TdP and Cardiac Arrest - Case Study: 56 year old male

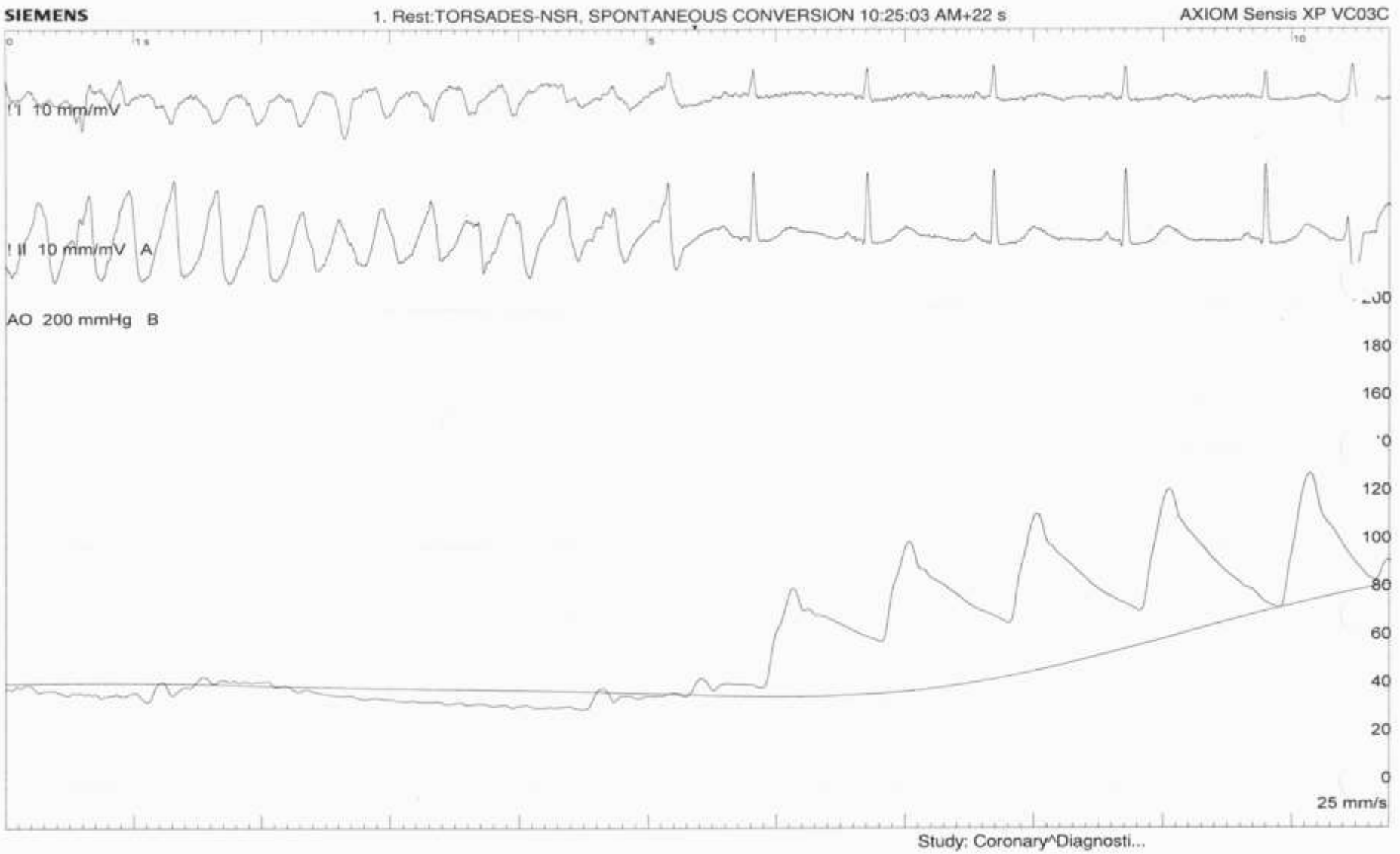


Medication induced LQTS with TdP and Cardiac Arrest - Case Study: 56 year old male



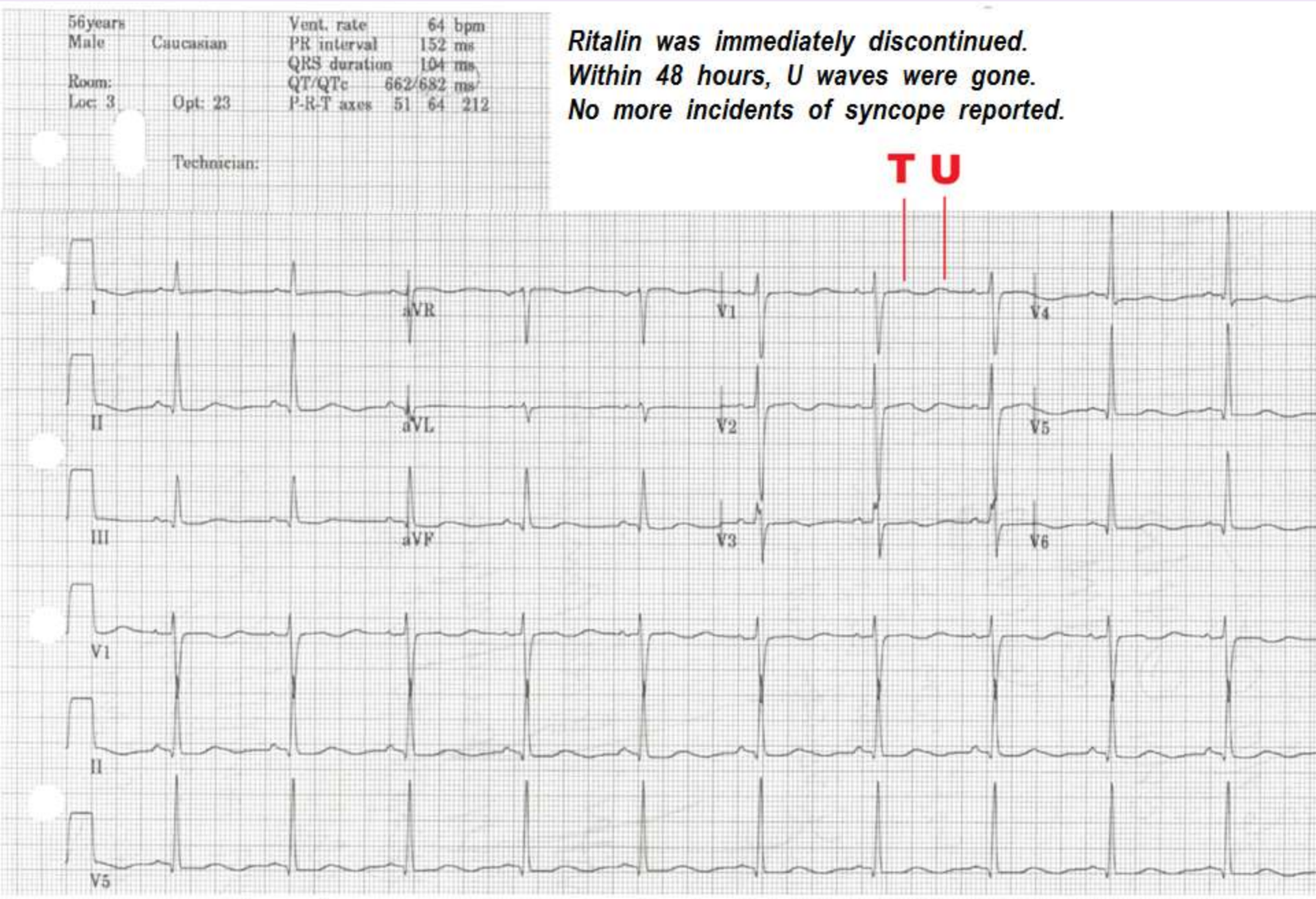
Run of Torsades de Pointes occurred during Cardiac Catheterization . . .

Medication induced LQTS with TdP and Cardiac Arrest - Case Study: 56 year old male



Torsades de Pointes self-terminates just before aborted Defibrillation

Medication induced LQTS with TdP and Cardiac Arrest - Case Study: 56 year old male

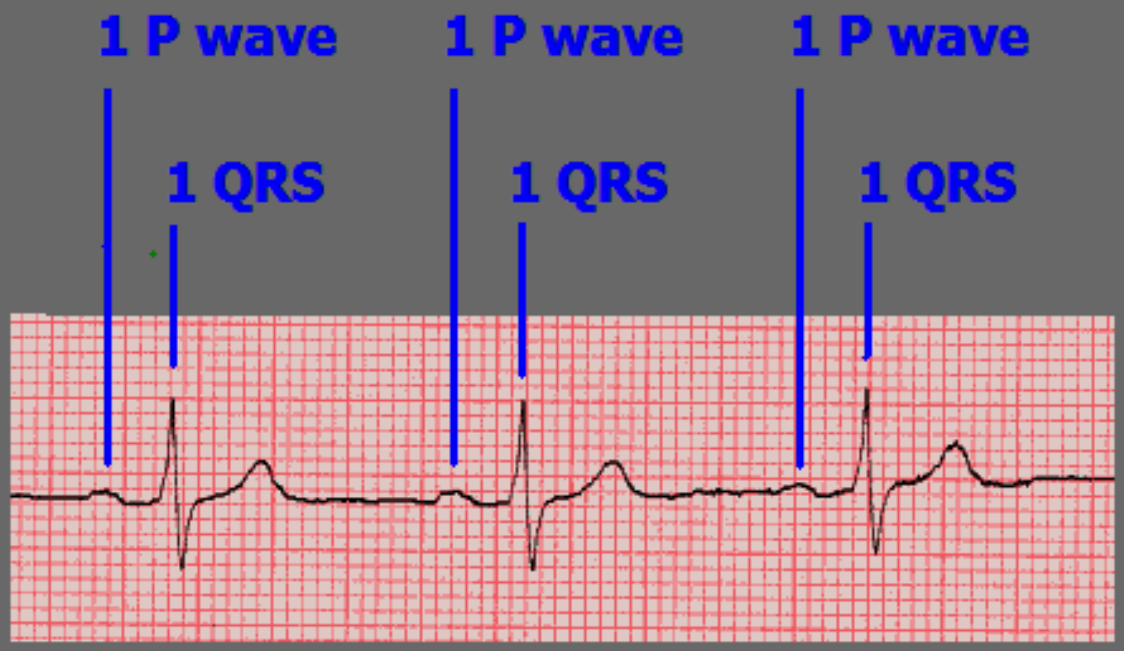


ESTABLISH YOUR ROUTINE ECG EVALUATION.....

- [x] RATE
- [x] RHYTHM
- [x] INTERVALS
- [ ] P:QRS RATIO

DETERMINE P : QRS RATIO

SIMPLY STATED, SHOULD ALWAYS BE 1 : 1



P : QRS RATIO

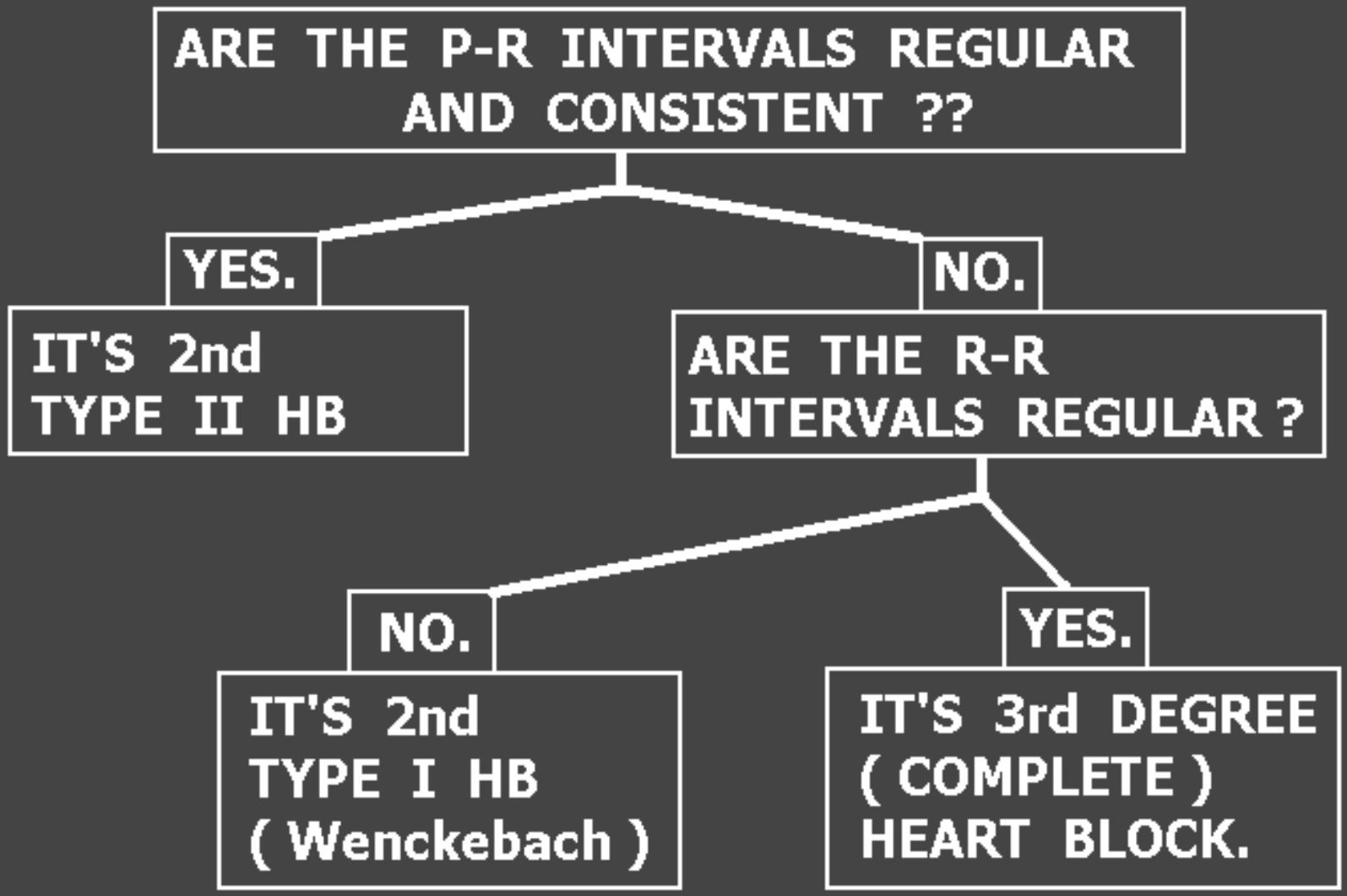
IF GREATER THAN 1 : 1

THINK:

- 2° HEART BLOCK
  (TYPE 1 or 2)
- 3° HEART BLOCK
- ATRIAL FLUTTER
  (SAW-TOOTHED "F" WAVES)

DIAGNOSING 2nd and 3rd DEGREE HEART BLOCK

MORE P-WAVES THAN QRS COMPLEXES PRESENT.



LET'S TEST THE PROCEDURE . . .

1

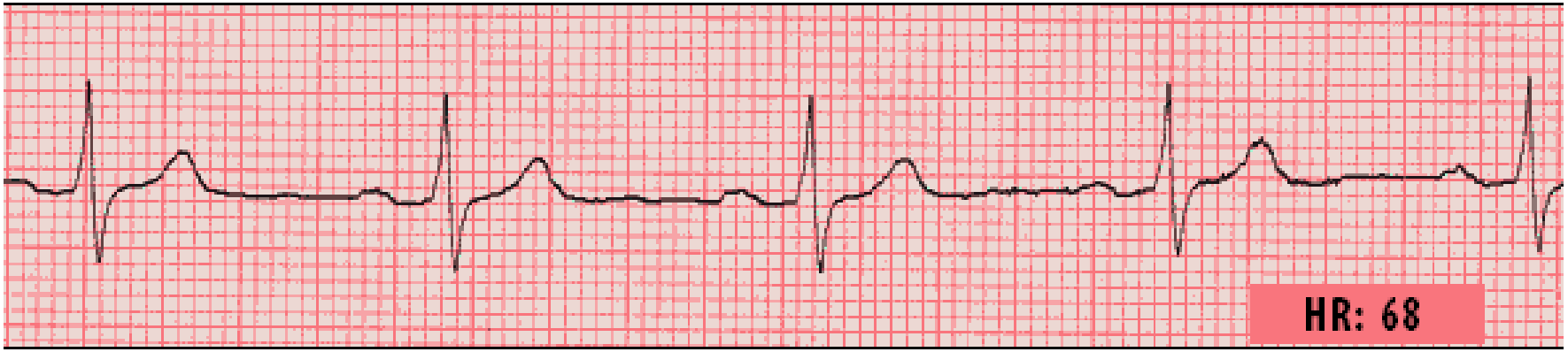
2

3

ESTABLISH YOUR ROUTINE ECG EVALUATION.....

- [x] RATE
- [x] RHYTHM
- [x] INTERVALS
- [x] P:QRS RATIO

THIS RHYTHM IS: NORMAL SINUS RHYTHM

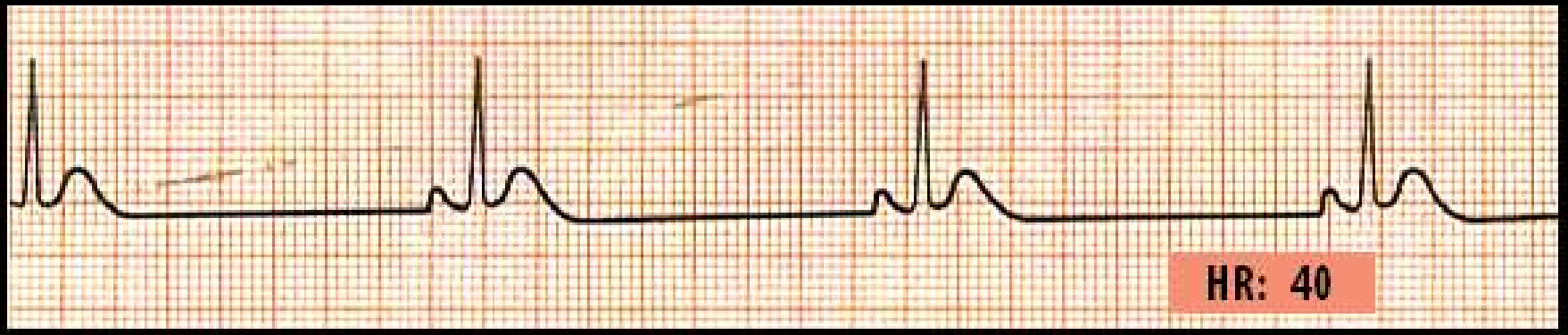


MAIN IDENTIFICATION CHARACTERISTIC(S): PERFECTLY NORMAL IN EVERY WAY!

RATE ---------- BETWEEN 60 - 100
RHYTHM ---------- REGULAR
P-R INTERVAL ----- 120 - 200 ms (.12 - .20)
P: QRS RATIO ------ 1 : 1
QRS INTERVAL ----- NORMAL (LESS THAN 120 ms)

POTENTIAL PROBLEMS: NONE!

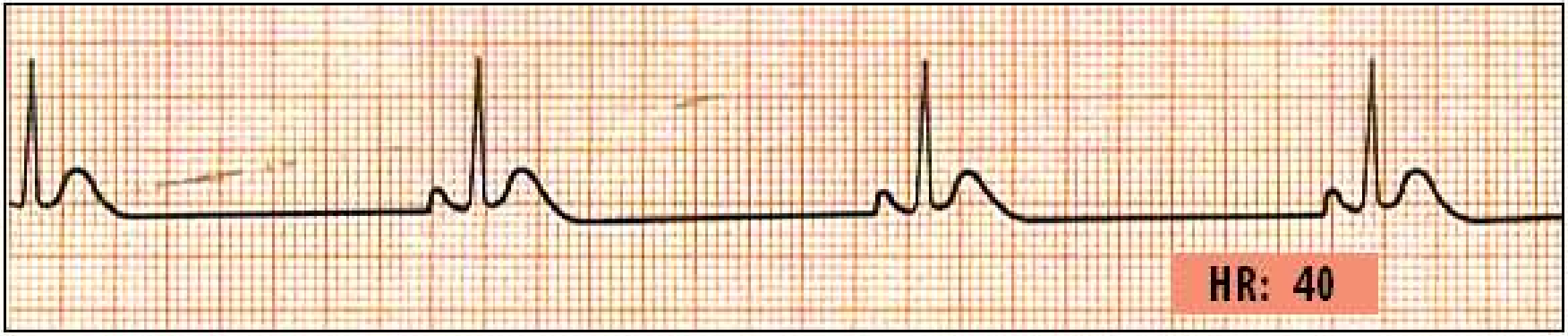
THIS RHYTHM IS:



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -------
P: QRS RATIO -------
QRS INTERVAL ------

THIS RHYTHM IS: SINUS BRADYCARDIA



MAIN IDENTIFICATION CHARACTERISTIC(S): HEART RATE LESS THAN 60

RATE	LESS THAN 60
RHYTHM	REGULAR
P-R INTERVAL	NORMAL (120-200 ms)
P:QRS RATIO	1:1
QRS INTERVAL	NORMAL (< 120 ms)

POTENTIAL PROBLEM (S):

- HYPOTENSION / SHOCK
- MAY HAVE OTHER SERIOUS PROBLEMS (SUCH AS ACUTE MI)

SHOCK ASSESSMENT

SHOCK =

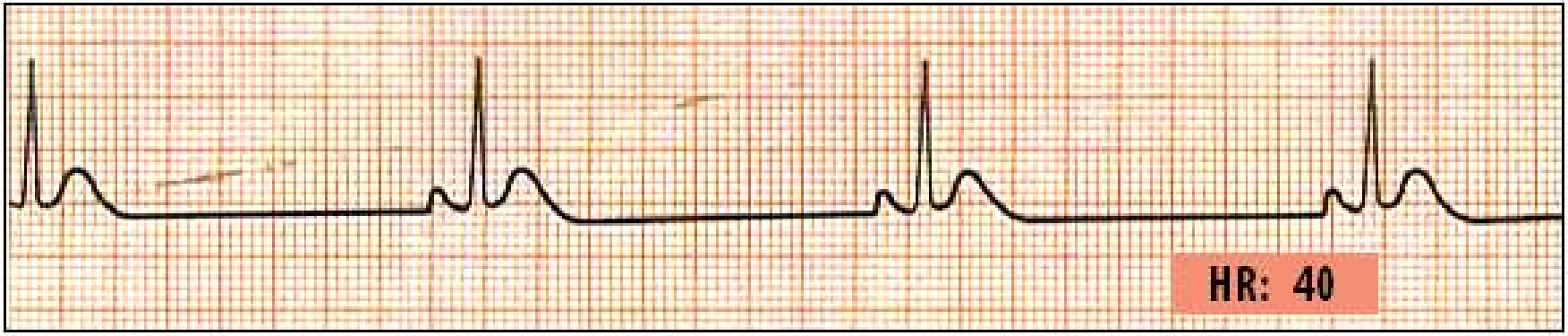
INADEQUTE TISSUE PERFUSION

- STARTS THE INSTANT YOU SEE PATIENT
- ENDS WHEN YOU REACH THE PATIENT'S SIDE

SHOCK ASSESSMENT

LOC:	ANXIOUS RESTLESS LETHARGIC UNCONSCIOUS	AWAKE ALERT & ORIENTED
SKIN:	PALE / ASHEN CYANOTIC COOL DIAPHORETIC	NORMAL HUE WARM DRY
BREATHING:	TACHYPNEA	NORMAL
PULSE:	WEAK / THREADY TOO FAST or SLOW	STRONG
STATUS:	SHOCK	NORMAL

THIS RHYTHM IS: SINUS BRADYCARDIA



WE MUST CONSIDER UNDERLYING CAUSES:		AND TREAT THEM:
INCREASED VAGAL TONE	→	ATROPINE
BLOCKED SA NODAL ARTERY (INFERIOR WALL MI)	→	CARDIAC CATH - PTCA / STENT THROMBOLYTICS
ELECTROLYTE IMBAL. (K+)	→	CORRECT ELECTROLYTES
HYPOTHERMIA	→	WARM PATIENT
ORGANOPHOSPHATE POISONING	→	ATROPINE
ATHLETIC METABOLISM (excellent health!)	→	COMPLIMENT PATIENT!

THIS RHYTHM IS:

MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -------
P: QRS RATIO -------
QRS INTERVAL ------

THIS RHYTHM IS: FIRST DEGREE HEART BLOCK

MAIN IDENTIFICATION CHARACTERISTIC(S): P-R INTERVAL TOO LONG - (GREATER THAN 200 mSEC.)

RATE	NORMAL
RHYTHM	REGULAR
P-R INTERVAL	> 200 mSEC.
P:QRS RATIO	1:1
QRS INTERVAL	NORMAL

THIS RHYTHM IS: FIRST DEGREE HEART BLOCK

MAIN IDENTIFICATION CHARACTERISTIC(S): P-R INTERVAL TOO LONG - (GREATER THAN 200 mSEC.)

POTENTIAL PROBLEMS:

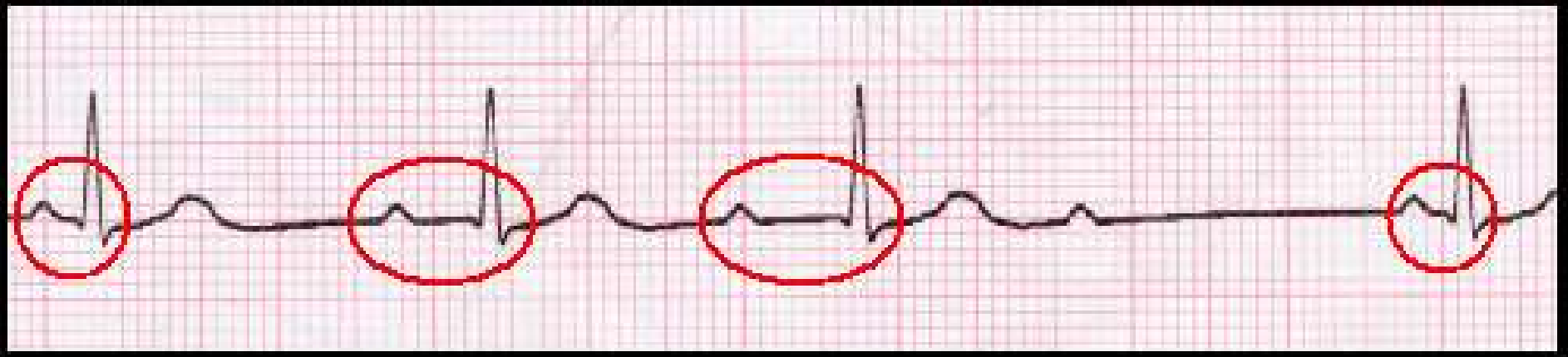
- HR MAY BE BRADYCARDIC (<60)
- MAY PROGRESS TO HIGHER GRADE HB (2°, 3°) with SLOWER VENTRICULAR RATE

THIS RHYTHM IS:

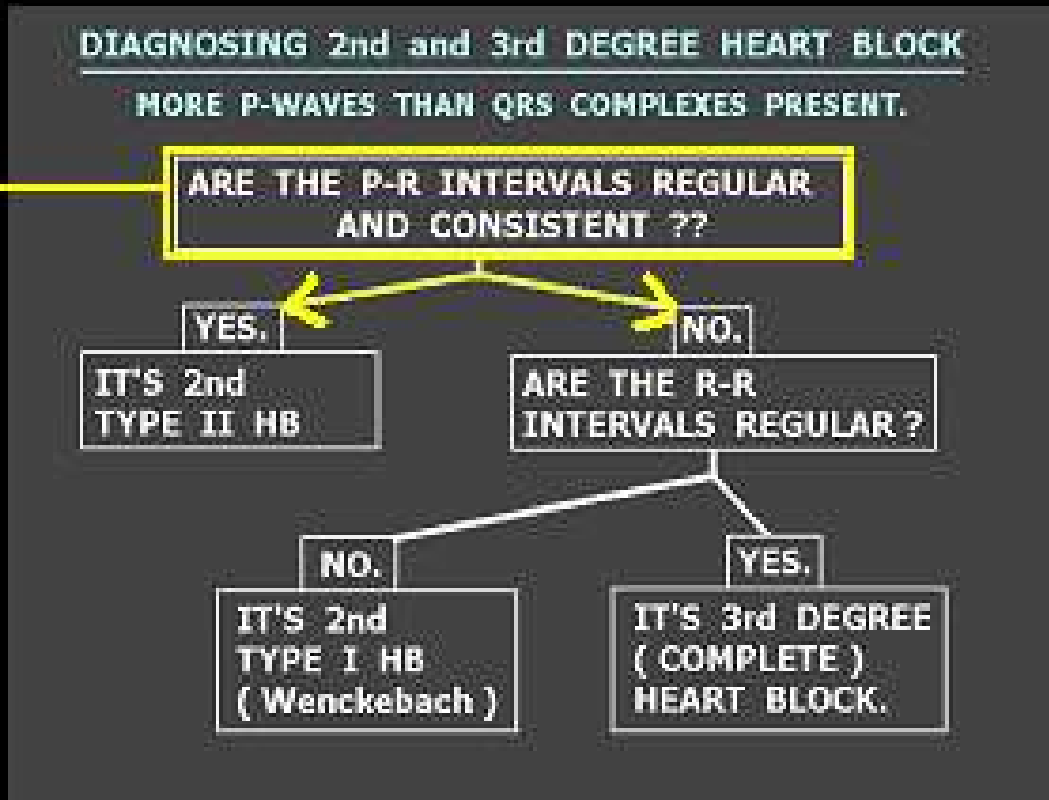
MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL ------
P: QRS RATIO -------
QRS INTERVAL -----

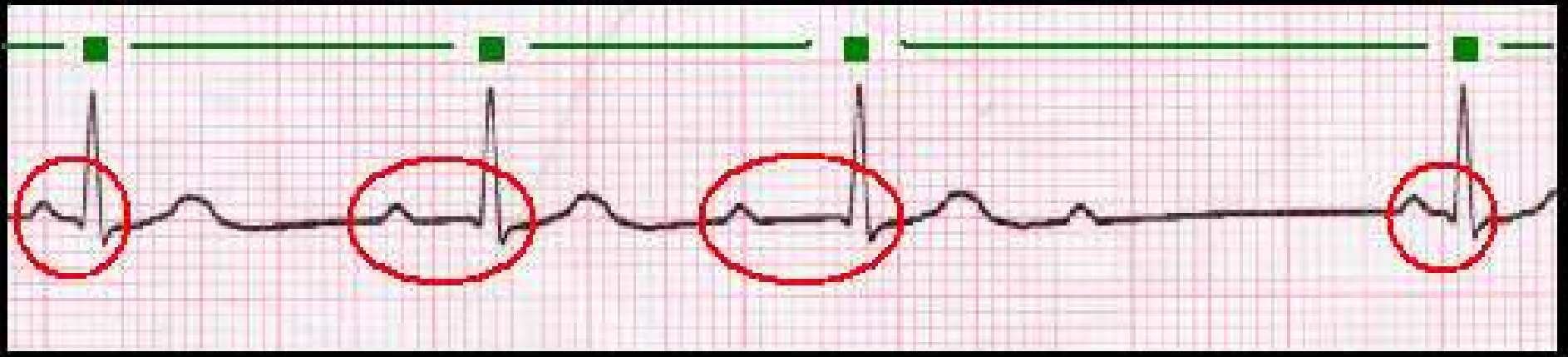
WHEN YOU SEE "EXTRA P WAVES". . . .



STEP 1
EVALUATE P - R RELATIONSHIP



WHEN YOU SEE "EXTRA P WAVES". . . .



STEP 1
EVALUATE P - R RELATIONSHIP

STEP 2
EVALUATE R - R INTERVALS

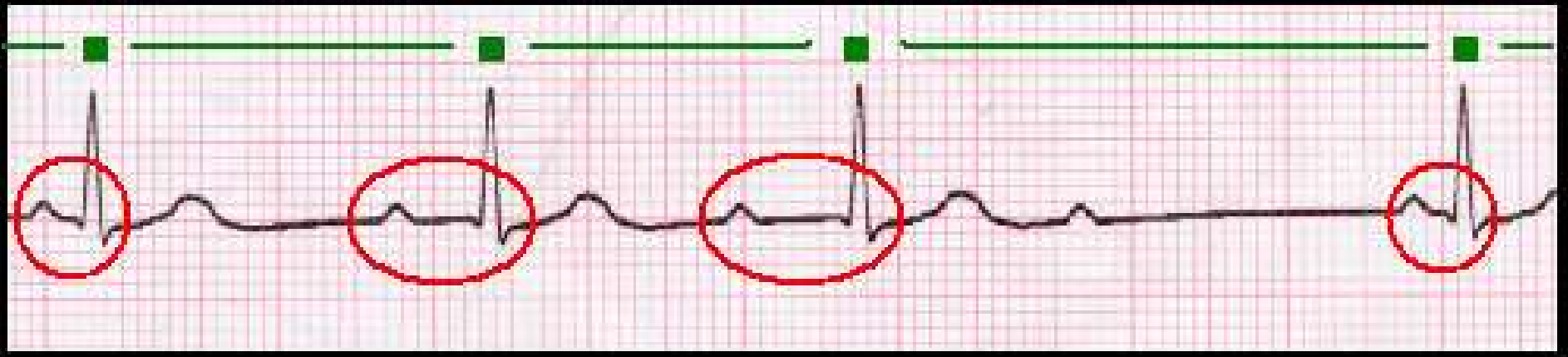
DIAGNOSING 2nd and 3rd DEGREE HEART BLOCK

MORE P-WAVES THAN QRS COMPLEXES PRESENT.

ARE THE P-R INTERVALS REGULAR AND CONSISTENT ??

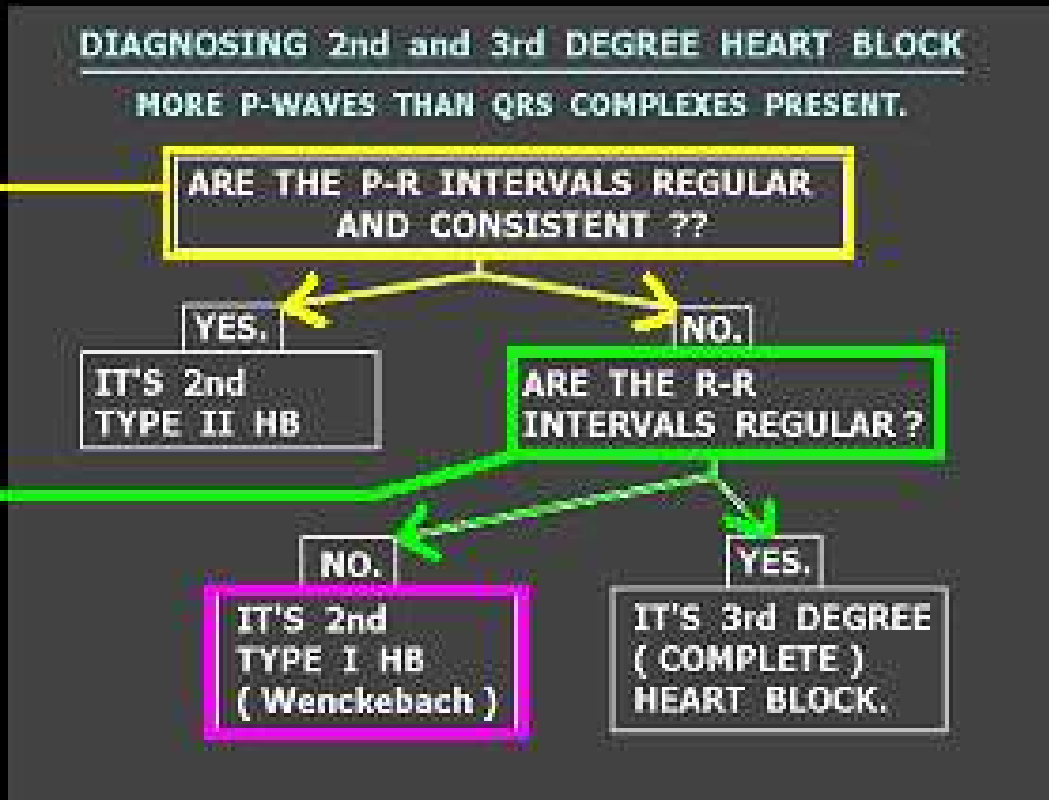
- YES. → IT'S 2nd TYPE II HB
- NO. → ARE THE R-R INTERVALS REGULAR ?
  - NO. → IT'S 2nd TYPE I HB (Wenckebach)
  - YES. → IT'S 3rd DEGREE (COMPLETE) HEART BLOCK.

WHEN YOU SEE "EXTRA P WAVES". . . .

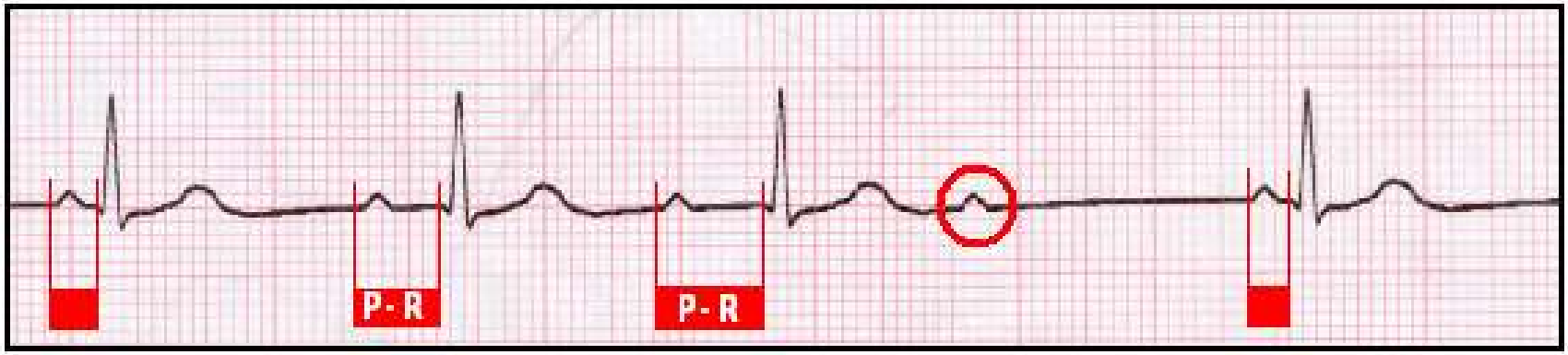


STEP 1
EVALUATE P - R RELATIONSHIP

STEP 2
EVALUATE R - R INTERVALS



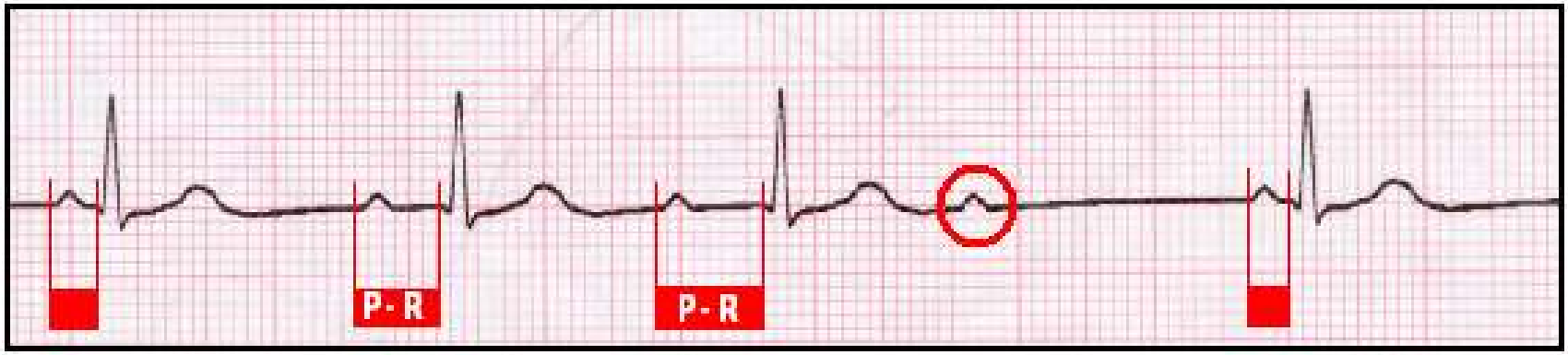
THIS RHYTHM IS: 2nd° TYPE I HB (Wenckebach)



MAIN IDENTIFICATION CHARACTERISTIC(S): P-R INTERVAL GETS PROGRESSIVELY LONGER UNTIL IT DROPS A QRS -- THEN CYCLE REPEATS

RATE	NORMAL or BRADYCARDIC
RHYTHM	REGULARLY IRREGULAR
P-R INTERVAL	VARIES (regularly irregular)
P:QRS RATIO	VAIRES (usually 1:1 and 2:1)
QRS INTERVAL	NORMAL

THIS RHYTHM IS: 2nd° TYPE I HB (Wenckebach)



MAIN IDENTIFICATION CHARACTERISTIC(S): P-R INTERVAL GETS PROGRESSIVELY LONGER UNTIL IT DROPS A QRS -- THEN CYCLE REPEATS

POTENTIAL PROBLEMS:

- HR MAY BE BRADYCARDIC (<60)
- MAY PROGRESS TO HIGHER GRADE HB (2° type II, 3°) with SLOWER VENTRICULAR RATE
- PT MAY BE SYMPTOMATIC (SHOCK) FROM ↓ CARDIAC OUTPUT

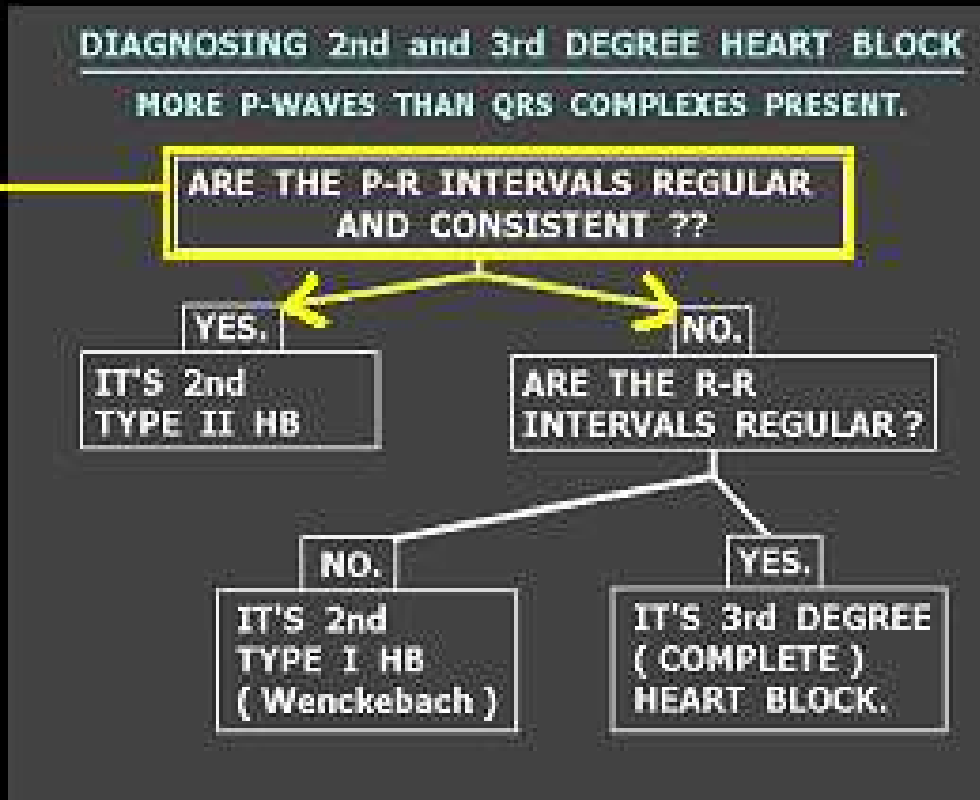
THIS RHYTHM IS:

MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -------
P: QRS RATIO -------
QRS INTERVAL ------

WHEN YOU SEE "EXTRA P WAVES". . . .

STEP 1
EVALUATE P - R RELATIONSHIP



WHEN YOU SEE "EXTRA P WAVES". . . .

STEP 1
EVALUATE P - R RELATIONSHIP

DIAGNOSING 2nd and 3rd DEGREE HEART BLOCK

MORE P-WAVES THAN QRS COMPLEXES PRESENT.

ARE THE P-R INTERVALS REGULAR AND CONSISTENT ??

- **YES.** → **IT'S 2nd TYPE II HB**
- **NO.** → **ARE THE R-R INTERVALS REGULAR ?**
  - **NO.** → **IT'S 2nd TYPE I HB (Wenckebach)**
  - **YES.** → **IT'S 3rd DEGREE (COMPLETE) HEART BLOCK.**

THIS RHYTHM IS: 2nd° TYPE II HEART BLOCK

MAIN IDENTIFICATION CHARACTERISTIC(S): MORE THAN ONE P WAVE FOR EACH QRS -- BUT EVERY QRS HAS A NORMAL, CONSISTENT P-R INTERVAL

RATE ---------- USUALLY BRADYCARDIC
RHYTHM ---------- USUALLY REGULAR (can be irregular)
P-R INTERVAL ------ NORMAL and CONSISTENT
P:QRS RATIO ------- ≥ 2:1
QRS INTERVAL ------ NORMAL

THIS RHYTHM IS: 2nd° TYPE II HEART BLOCK

MAIN IDENTIFICATION CHARACTERISTIC(S): MORE THAN ONE P WAVE FOR EACH QRS -- BUT EVERY QRS HAS A NORMAL, CONSISTENT P-R INTERVAL

POTENTIAL PROBLEMS:

- PT MAY BE SYMPTOMATIC (SHOCK) FROM ↓ CARDIAC OUTPUT
- BLOCKAGE MAY ADVANCE TO VENTRICULAR STANDSTILL (ADAMS-STOKES SYNDROME) AND CARDIAC ARREST
- MAY PROGRESS TO COMPLETE (3rd°) HEART BLOCK

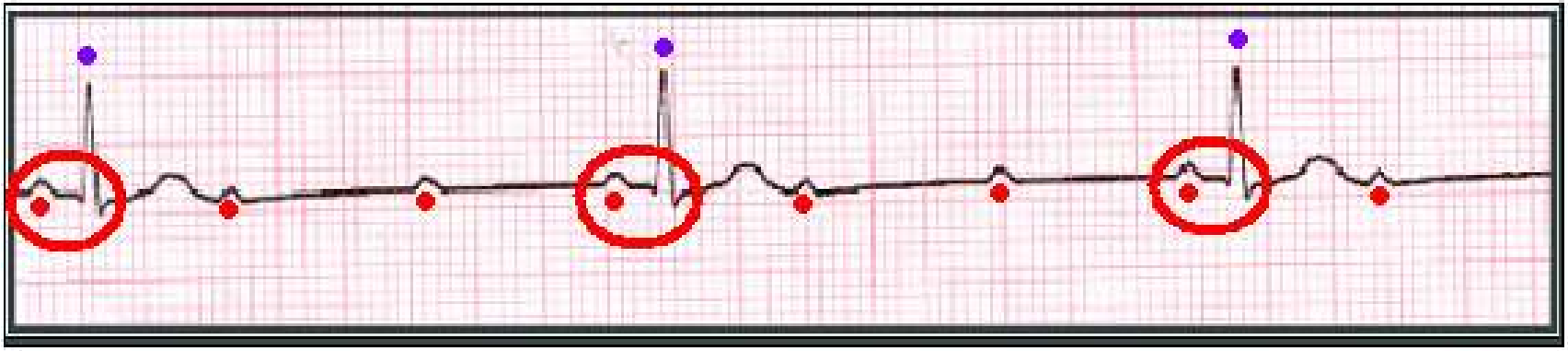
-- CRITICAL ECG ALERT --

-Immediately check patient

-Notify next "higher up" in chain of command

1. **Heart rate LESS THAN 50 or GREATER THAN 150**
2. **QT INTERVAL prolonged (usually not emergent but let Dr. know)**
3. **2nd degree type II or 3rd degree HEART BLOCK**

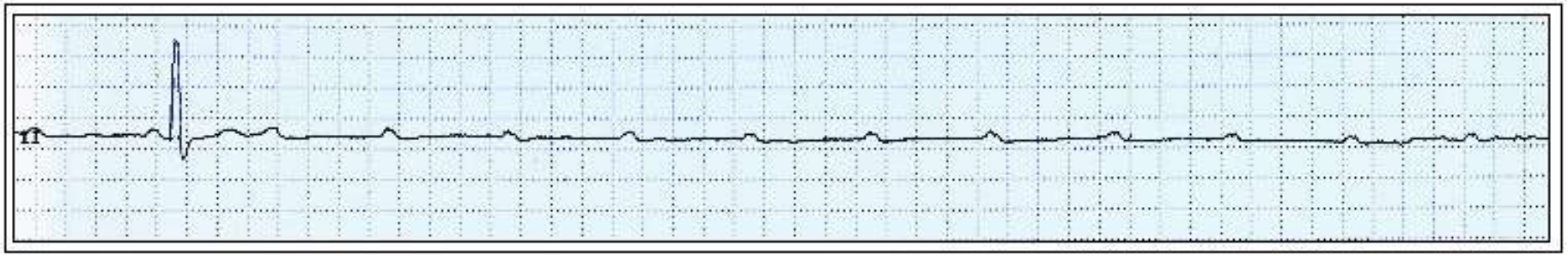
THIS RHYTHM IS: 2nd° TYPE II HEART BLOCK



MAIN IDENTIFICATION CHARACTERISTIC(S): MORE THAN ONE P WAVE FOR EACH QRS -- BUT EVERY QRS HAS A NORMAL, CONSISTENT P-R INTERVAL

ADAMS-STOKES SYNDROME is essentially spontaneous CARDIAC ARREST -- characterized by episodes of ASYSTOLE, VENTRICULAR STANDSTILL and V-FIB. In this regard, 2nd° TYPE II HB can be more dangerous than 3rd° HB (at least 3rd° Heart Block has an ESCAPE RHYTHM)

ADAMS - STOKES SYNDROME



CASE HISTORY:

72 y/o male with history of SYNCOPE OF UNKOWN ORIGIN. While undergoing Cardiac Catherization (Left Heart Cath), pt went from NSR rate 76 - 80 to 2nd o TYPE II HEART BLOCK, which quickly deteriorated into VENTRICULAR STANDSTILL .

TX: CPR, Atropine, Transvenous Pacemaker, followed by Permanent Pacemaker Implanation. Patient experienced full recovery, was discharged.

THIS RHYTHM IS:

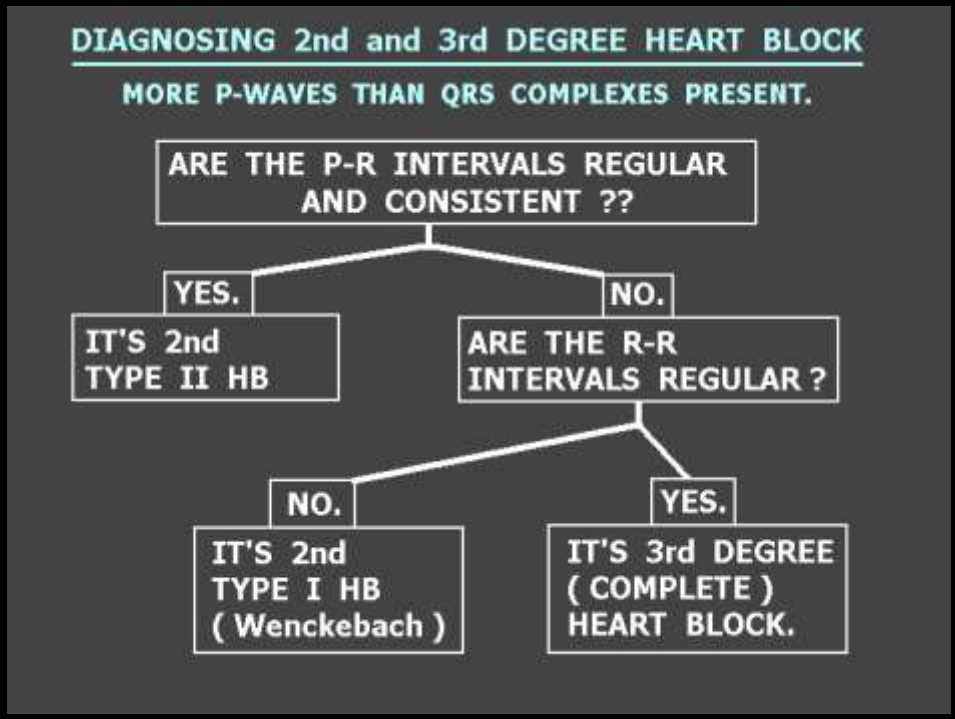
MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P:QRS RATIO -----
QRS INTERVAL -----

THIS RHYTHM IS:

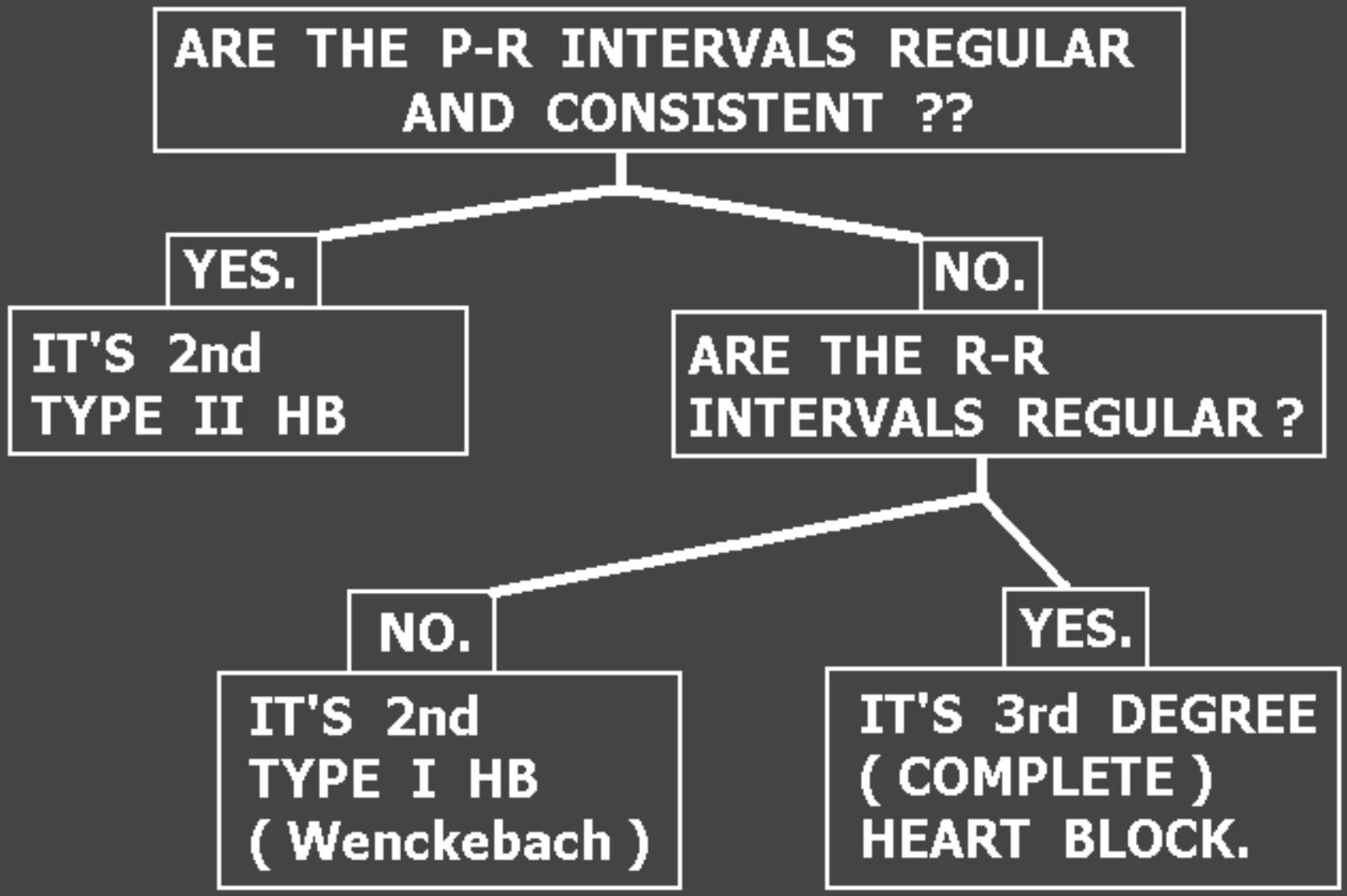
MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P:QRS RATIO -----
QRS INTERVAL -----



DIAGNOSING 2nd and 3rd DEGREE HEART BLOCK

MORE P-WAVES THAN QRS COMPLEXES PRESENT.

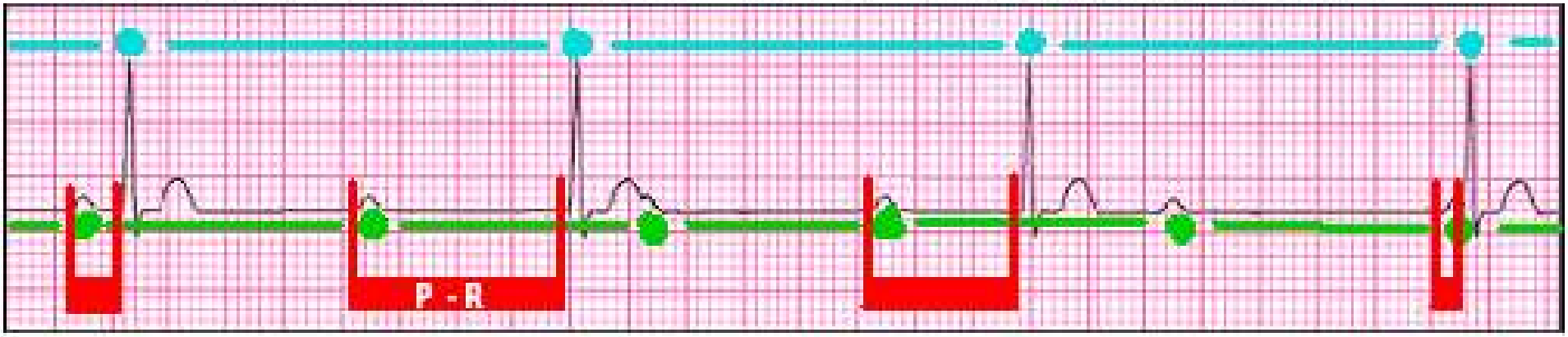


THIS RHYTHM IS: 3rd° HB c̄ JUNCTIONAL ESCAPE

MAIN IDENTIFICATION CHARACTERISTIC(S): **P-R INTERVAL INCOSISTENT, P-P INTERVALS REGULAR, R-R INTERVALS REGULAR-- NO RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES.**

RATE ----------	USUALLY BRADYCARDIC (40-60 JUNCTIONAL RATE)
RHYTHM ----------	REGULAR
P-R INTERVAL ----	INCONSISTENT (irregularly irregular)
P:QRS RATIO ----	VARIES - USUALLY > 2:1
QRS INTERVAL ---	NORMAL (< 120 ms) UNLESS PT HAS BUNDLE BRANCH BLOCK

THIS RHYTHM IS: 3rd° HB c JUNCTIONAL ESCAPE



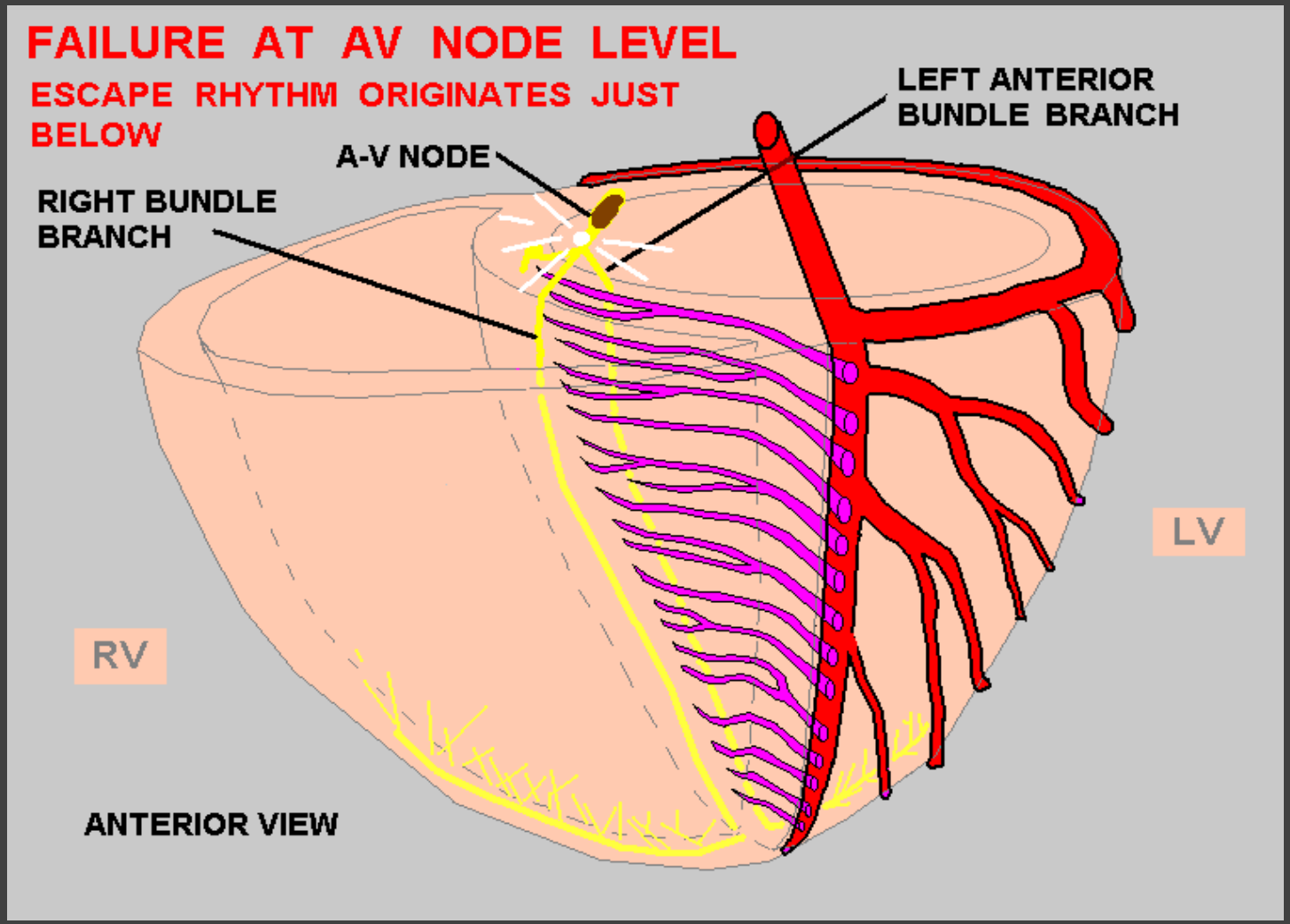
MAIN IDENTIFICATION CHARACTERISTIC(S): P - R INTERVAL INCOSISTENT, P - P INTERVALS REGULAR, R - R INTERVALS REGULAR -- NO RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES.

POTENTIAL PROBLEMS:

- HYPOTENSION and SHOCK due to ↓ HEART RATE and ↓ CARDIAC OUTPUT

FAILURE AT AV NODE LEVEL

ESCAPE RHYTHM ORIGINATES JUST BELOW



THIS RHYTHM IS:

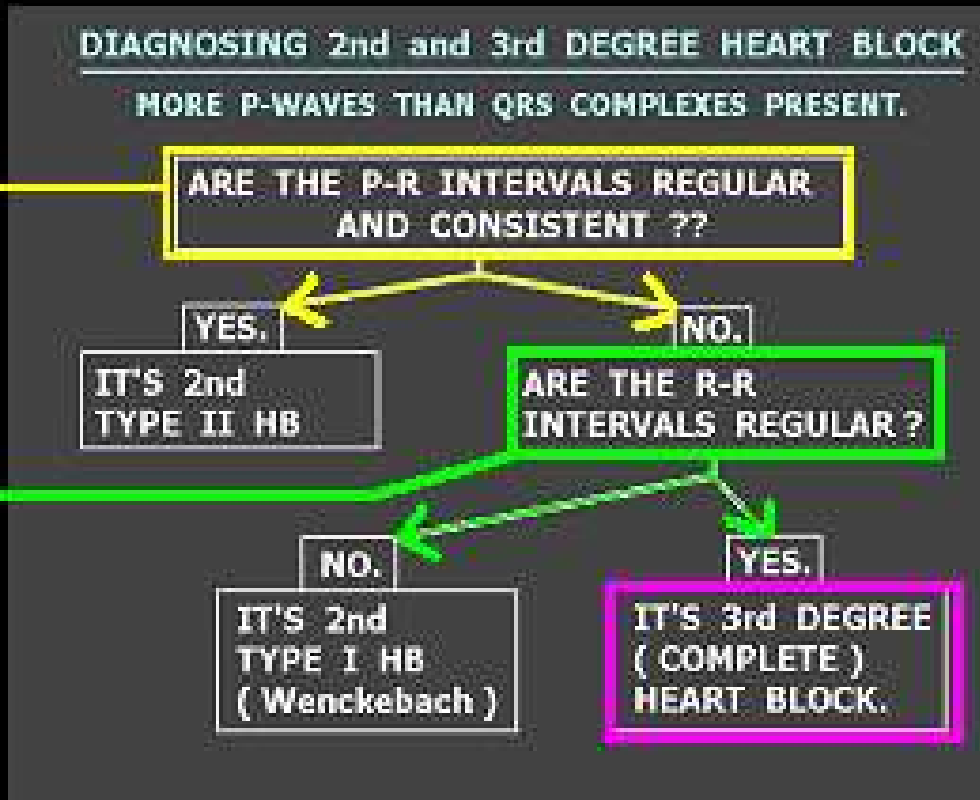
MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL ----
P:QRS RATIO ----
QRS INTERVAL ----

WHEN YOU SEE "EXTRA P WAVES". . . .

STEP 1
EVALUATE P - R RELATIONSHIP

STEP 2
EVALUATE R - R INTERVALS

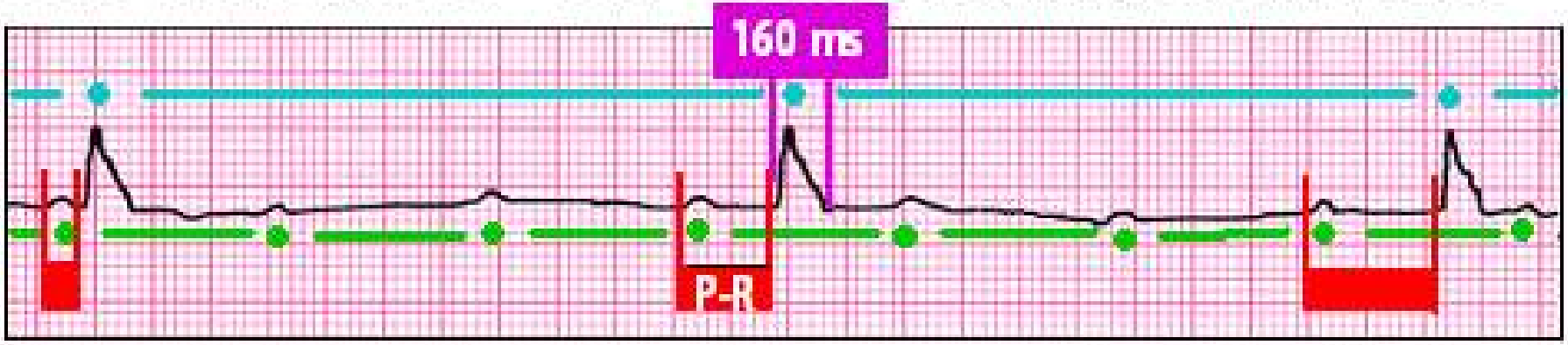


THIS RHYTHM IS: 3rd° HB & IDIOVENTRICULAR ESCAPE

MAIN IDENTIFICATION CHARACTERISTIC(S): P-R INTERVALS INCONSISTENT P-P INTERVALS REGULAR, R-R INTERVALS REGULAR. NO RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES. QRS COMPLEXES are WIDER THAN 120ms, AND OF SLOW VENTRICULAR RATE (usually < 40)

RATE	USUALLY BRADYCARDIC (< 40 VENTRICULAR RATE)
RHYTHM	REGULAR
P-R INTERVAL	INCONSISTENT (irregularly irregular)
P:QRS RATIO	VARIES - USUALLY > 2:1
QRS INTERVAL	WIDER THAN 120 ms

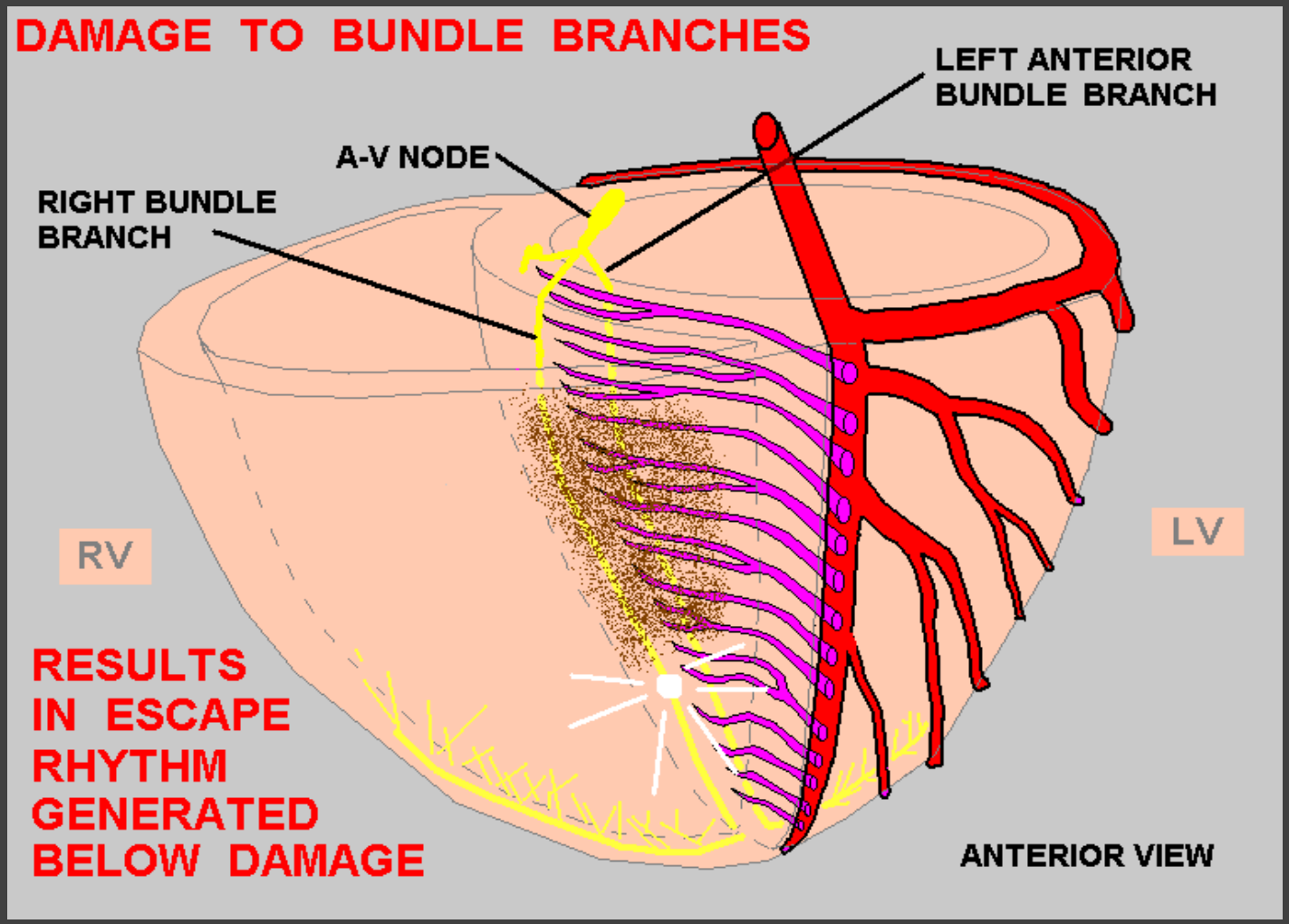
THIS RHYTHM IS: 3rd° HB & IDIOVENTRICULAR ESCAPE



MAIN IDENTIFICATION CHARACTERISTIC(S): P-R INTERVALS INCONSISTENT P-P INTERVALS REGULAR, R-R INTERVALS REGULAR. NO RELATIONSHIP BETWEEN P WAVES AND QRS COMPLEXES. QRS COMPLEXES are WIDER THAN 120ms, AND RATE (usually < 40)

POTENTIAL PROBLEMS:

HYPOTENSION and SHOCK due to ↓ HEART RATE and ↓ CARDIAC OUTPUT


DAMAGE TO BUNDLE BRANCHES
LEFT ANTERIOR BUNDLE BRANCH
A-V NODE
RIGHT BUNDLE BRANCH
RV
LV
RESULTS IN ESCAPE RHYTHM GENERATED BELOW DAMAGE
ANTERIOR VIEW

SINUS ARREST.

Causes: SA Nodal disease, Increased vagal tone,
SA Node ischemia / MI

Hemodynamic Concerns: Patient may experience syncope,
cardiac arrest

Treatment: Atropine, CPR, Pacemaker

-- CRITICAL ECG ALERT --

-Immediately check patient

-Notify next "higher up" in chain of command

1. **Heart rate LESS THAN 50 or GREATER THAN 150**
2. **QT INTERVAL prolonged (usually not emergent but let Dr. know)**
3. **2nd degree type II or 3rd degree HEART BLOCK**
4. **SINUS ARREST with periods of ASYSTOLE**

COMMON Rx !

- SYMPTOMATIC BRADYCARDIAS
- HEART BLOCKS with SLOW VENTRICULAR RATES
  (patient symptomatic)

Tx:

- ✓ ABC s
- ✓ GENERAL SUPPORTIVE CARE
- ✓ BRADYCARDIA ALGORITHM

SYMPTOMATIC BRADYCARDIA

- **ABC s + GENERAL SUPPORTIVE CARE**
- **ATROPINE 0.5 mg. IV**
  - MAY REPEAT 0.5 mg. DOSES IF NEEDED
  - MAXIMUM 3.0 mg.
- **TRANSCUTANEOUS PACEMAKER**
  - PREFERRED PRIMARY Tx FOR HIGH GRADE A-V BLOCK

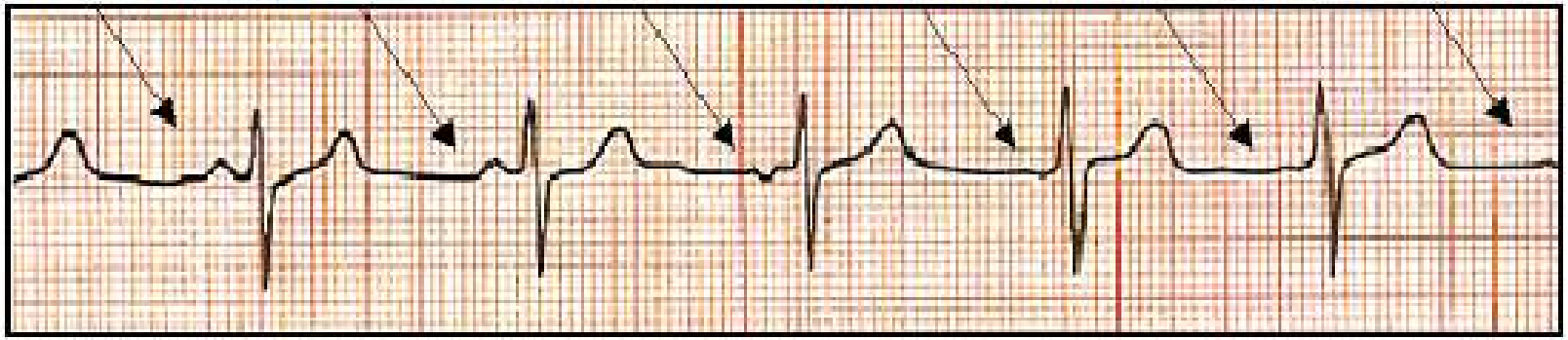
SYMPTOMATIC BRADYCARDIA

- **DOPAMINE gtt.**
  2 - 10 mcg / kg. / min. INFUSION RATE
  IF PACING NOT AVAILABLE or EFFECTIVE

- **EPINEPHRINE gtt.**
  2 - 10 mcg / min INFUSION RATE
  IF PACING NOT AVAILABLE or EFFECTIVE

- **TRANSVENOUS PACEMAKER**

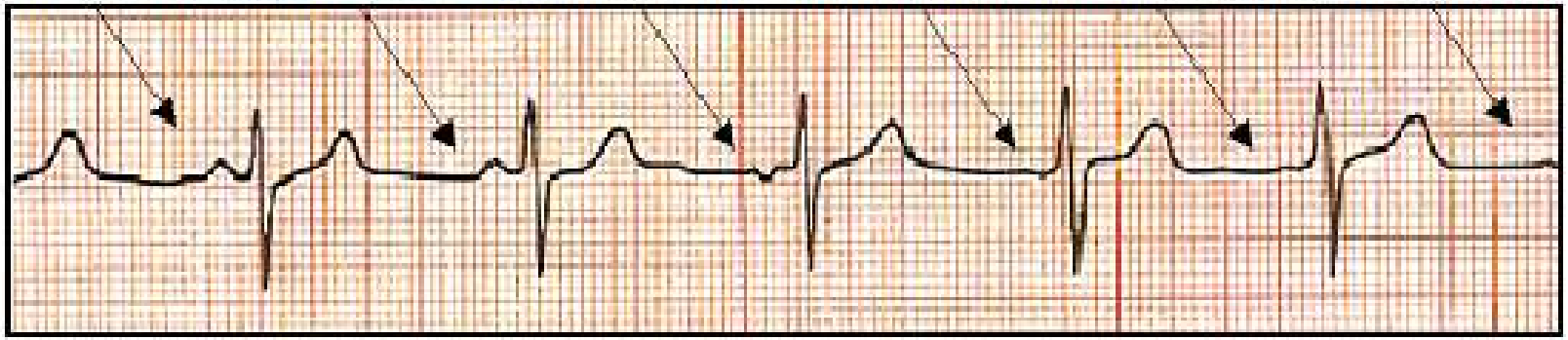
THIS RHYTHM IS: WANDERING ATRIAL PACEMAKER



MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ARE OF DIFFERENT SIZES, DEFLECTIONS, and P-R INTERVALS SLIGHTLY VARY

RATE	NORMAL
RHYTHM	NORMAL
P-R INTERVAL	SLIGHT VARIATION
P:QRS RATIO	1:1
QRS INTERVAL	NORMAL (unless BBB)

THIS RHYTHM IS: WANDERING ATRIAL PACEMAKER

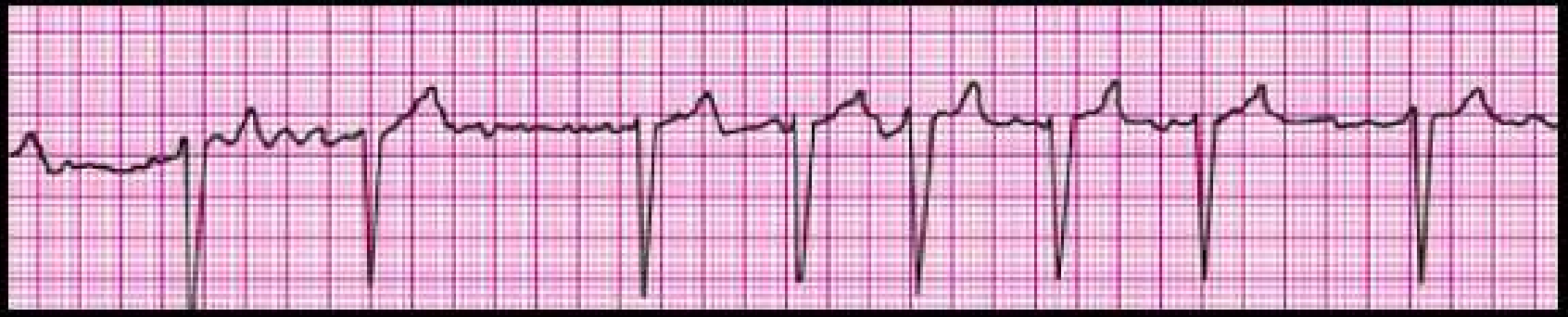


MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ARE OF DIFFERENT SIZES, DEFLECTIONS, and P-R INTERVALS SLIGHTLY VARY

POTENTIAL PROBLEM(S):

- USUALLY NONE.
- THIS RHYTHM IS SEEN MOST FREQUENTLY IN HEALTHY YOUNG CHILDREN

THIS RHYTHM IS:



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P: QRS RATIO -------
QRS INTERVAL -----

THIS RHYTHM IS: ATRIAL FIBRILLATION

MAIN IDENTIFICATION CHARACTERISTIC(S): **IRREGULARLY IRREGULAR R-R INTERVALS, NO DISCERNABLE P WAVES, FIBRILLATORY BASE-LINE.**

RATE ---------- BRADY, NORMAL, or TACHY
RHYTHM ---------- IRREGULARLY IRREGULAR
P-R INTERVAL ---- NOT DISCERNABLE
P:QRS RATIO ------ NOT DISCERNABLE
QRS INTERVAL ---- NORMAL, (unless BBB present)

THIS RHYTHM IS: ATRIAL FIBRILLATION

MAIN IDENTIFICATION CHARACTERISTIC(S): **IRREGULARLY IRREGULAR R-R INTERVALS, NO DISCERNABLE P WAVES, FIBRILLATORY BASE-LINE.**

POTENTIAL PROBLEMS:

- VENTRICULAR RATE CAN BECOME TOO SLOW or TOO FAST
- WITHOUT THE "ATRIAL KICK," CARDIAC OUTPUT DROPS 10-20%
- THROMBUS FORMATION MAY OCCUR IN THE LEFT ATRIAL APPENDAGE, PUTTING PATIENT AT HIGH RISK FOR CVA

THIS RHYTHM IS: ATRIAL FIBRILLATION

MAIN IDENTIFICATION CHARACTERISTIC(S): IRREGULARLY IRREGULAR R-R INTERVALS, NO DISCERNABLE P WAVES, FIBRILLATORY BASE-LINE.

TREATMENT / INTERVENTIONS:

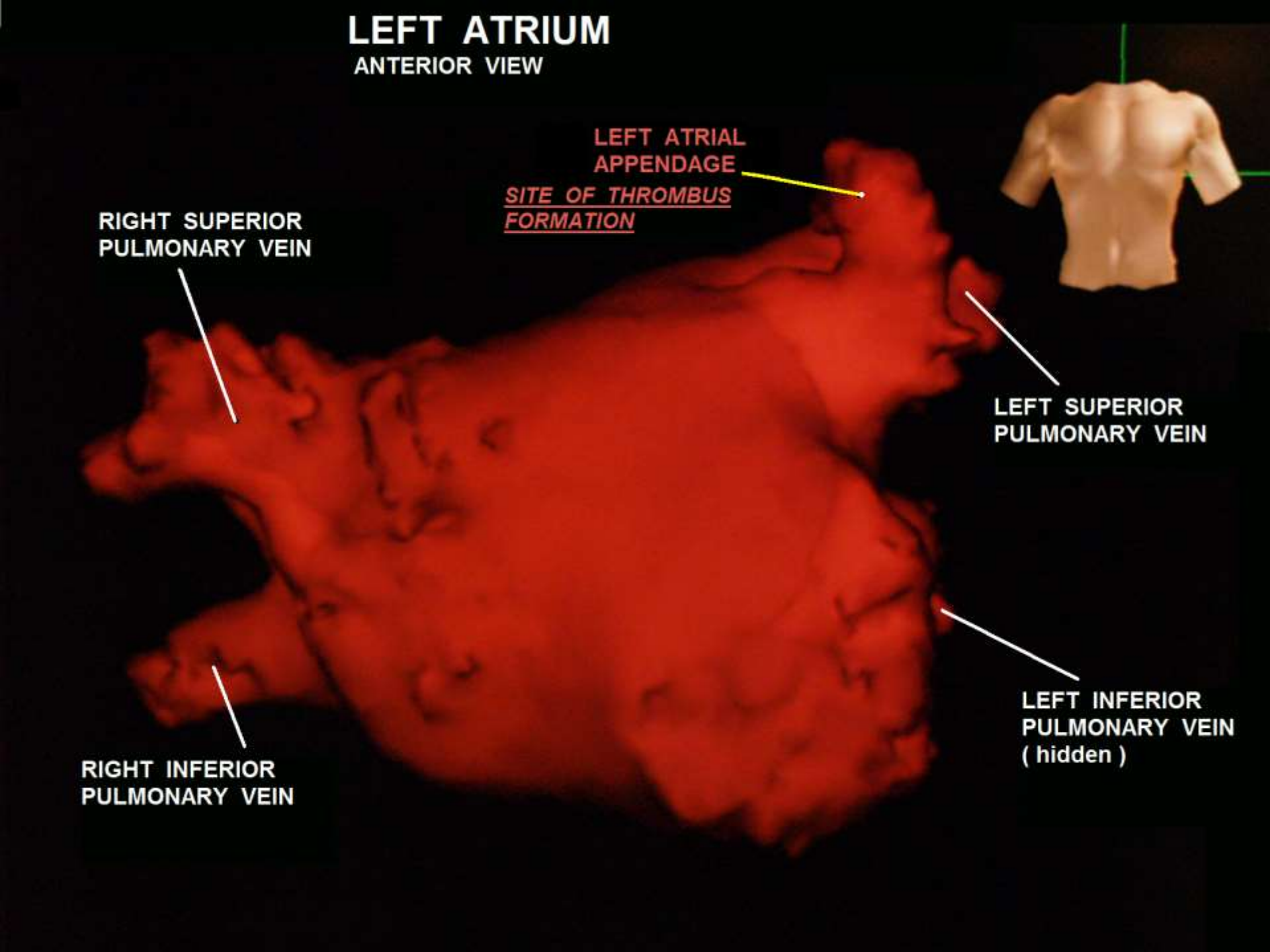
- NEED FOR EMERGENCY INTERVENTION FOR A-FIB IS BASED ON PATIENT'S VENTRICULAR RATE:
  - ☞ TOO SLOW - SYMPTOMATIC BRADYCARDIA ALGORITHM
  - ☞ TOO FAST - TACHYCARDIA ALGORITHM

-- CRITICAL ECG ALERT --

-Immediately check patient

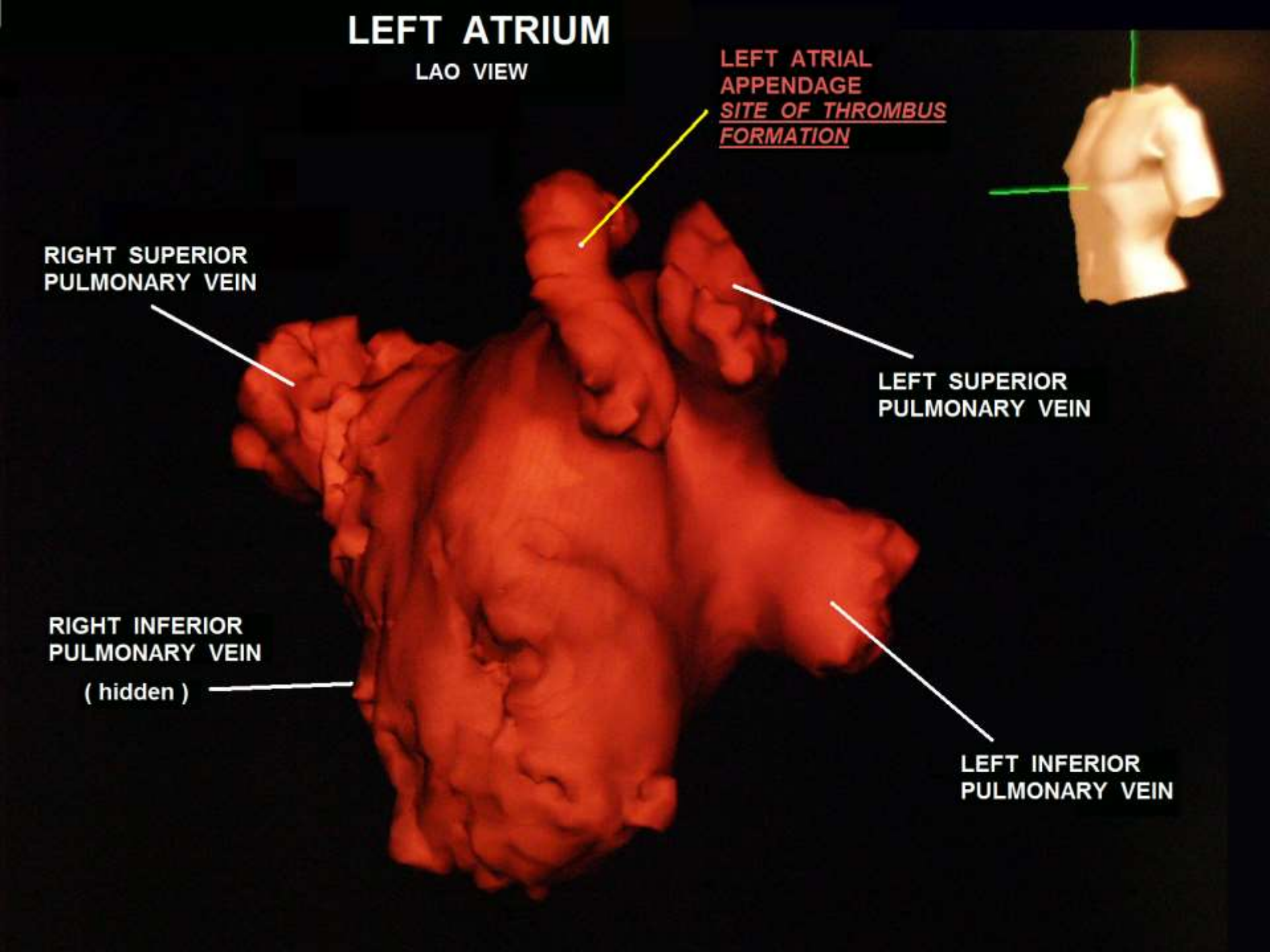
-Notify next "higher up" in chain of command

1. **Heart rate LESS THAN 50 or GREATER THAN 150**
2. **QT INTERVAL prolonged (usually not emergent but let Dr. know)**
3. **2nd degree type II or 3rd degree HEART BLOCK**
4. **SINUS ARREST with periods of ASYSTOLE**
5. **NEW ONSET of any DYSRHYTHMIA**

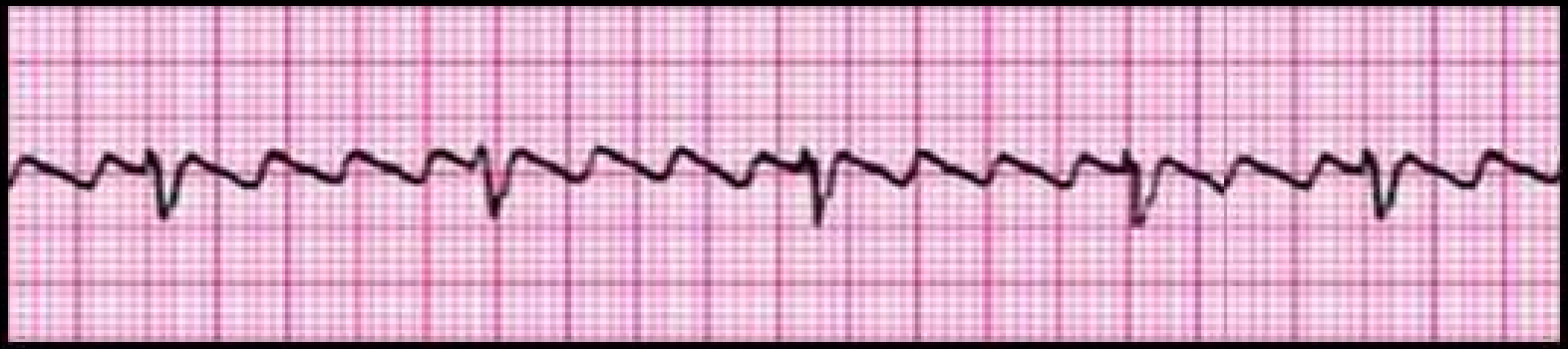

LEFT ATRIUM
ANTERIOR VIEW
LEFT ATRIAL APPENDAGE
SITE OF THROMBUS FORMATION
RIGHT SUPERIOR PULMONARY VEIN
LEFT SUPERIOR PULMONARY VEIN
RIGHT INFERIOR PULMONARY VEIN
LEFT INFERIOR PULMONARY VEIN (hidden)

LEFT ATRIUM

LAO VIEW



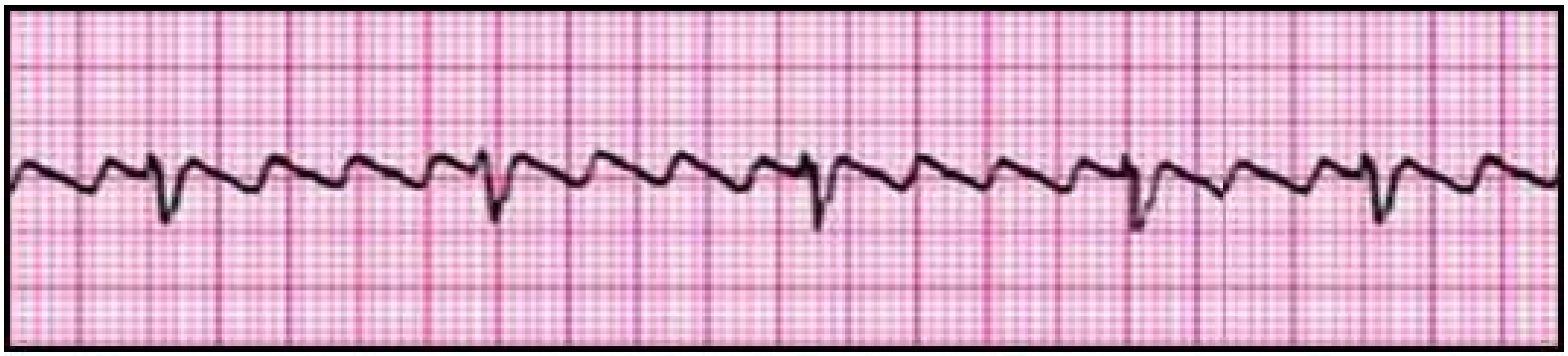
THIS RHYTHM IS:



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P: QRS RATIO -------
QRS INTERVAL -----

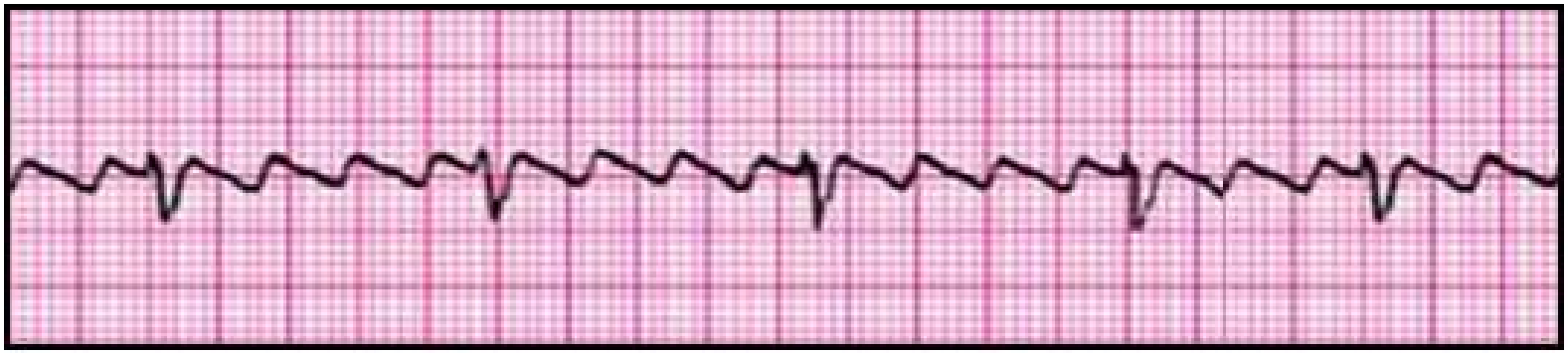
THIS RHYTHM IS: ATRIAL FLUTTER



MAIN IDENTIFICATION CHARACTERISTIC(S): RAPID RATE " SAW - TOOTHED " FLUTTER WAVES (F - WAVES)

RATE ---------- ATRIAL : 200 - 300, VENT: BRADY, NORMAL or TACHY
RHYTHM ---------- REGULAR or IRREGULAR
P-R INTERVAL ---- USUALLY NORMAL, CONSISTENT
P: QRS RATIO ------ VARIES (usually 3 : 1, 4 : 1, or 5 : 1)
QRS INTERVAL ---- NORMAL (unless BBB present)

THIS RHYTHM IS: ATRIAL FLUTTER



MAIN IDENTIFICATION CHARACTERISTIC(S): RAPID RATE " SAW - TOOTHED "
FLUTTER WAVES (F - WAVES)

POTENTIAL PROBLEM(S):

- VENTRICULAR RATE CAN BE TOO RAPID or TOO SLOW
- A-FLUTTER OFTEN IS INTERMITTENT WITH A-FIB -- A-FIB PRECAUTIONS APPLY (THROMBUS RISKS)

TREATMENT / INTERVENTIONS:

- ☞ TOO SLOW - SYMPTOMATIC BRADYCARDIA ALGORITHM
- ☞ TOO FAST - TACHYCARDIA ALGORITHM

68 yr
Male Hispanic

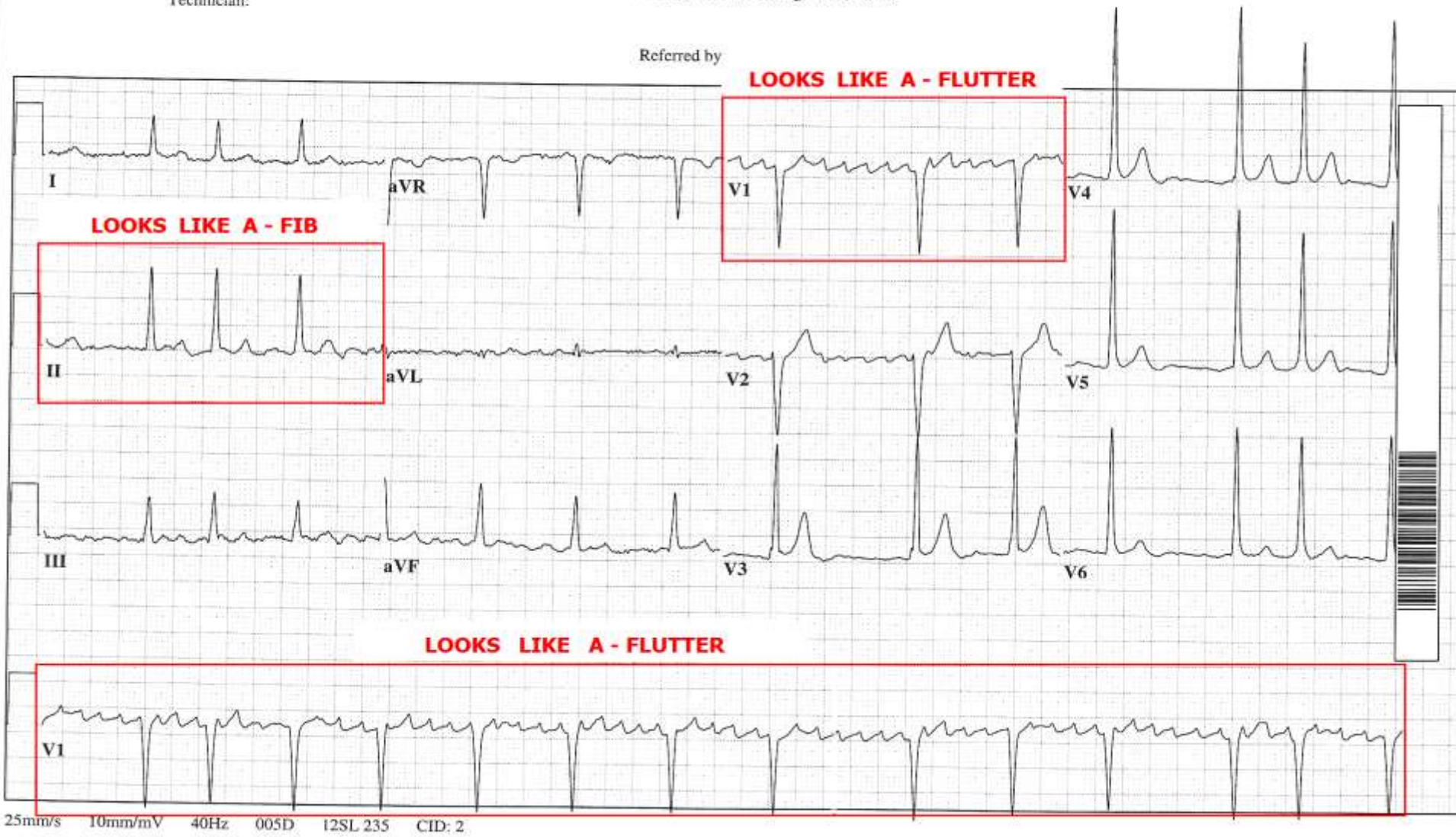
Room:VAM
Loc:3 Option:23

Vent. rate	85	BPM
PR interval	*	ms
QRS duration	100	ms
QT/QTc	342/406	ms
P-R-T axes	* 58	46

"**UNEDITED COPY: REPORT IS COMPUTER GENERATED ONLY, WITHOUT PHYSICIAN INTERPRETATION".
Atrial fibrillation
Voltage criteria for left ventricular hypertrophy
Abnormal ECG
When compared with ECG of 19-NOV-2006 07:39,
No significant change was found

Technician:

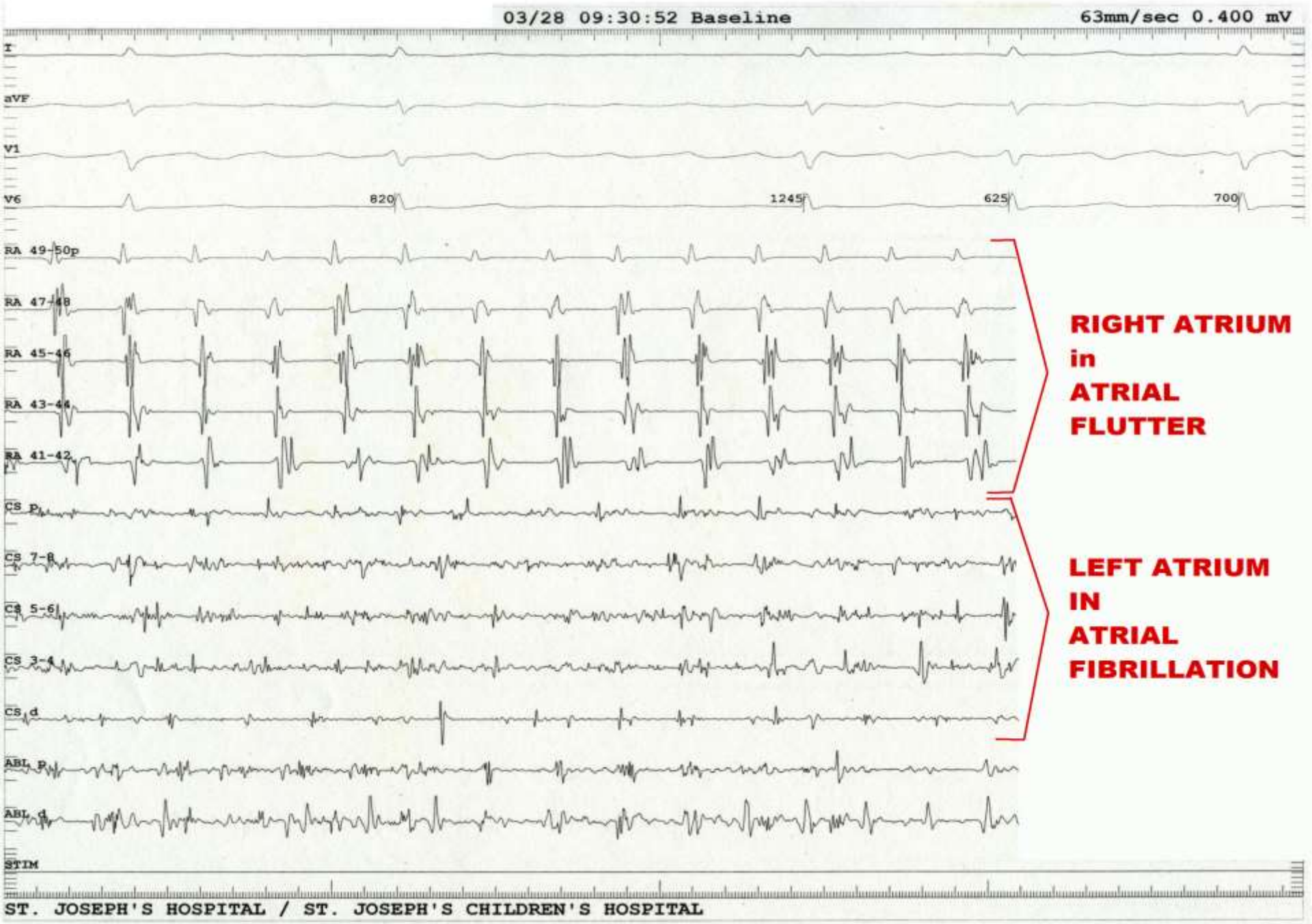
Referred by



25mm/s 10mm/mV 40Hz 005D 12SL 235 CID: 2

44 y/o FEMALE

"ATRIAL FIB - FLUTTER"



RIGHT ATRIUM in ATRIAL FLUTTER

LEFT ATRIUM IN ATRIAL FIBRILLATION

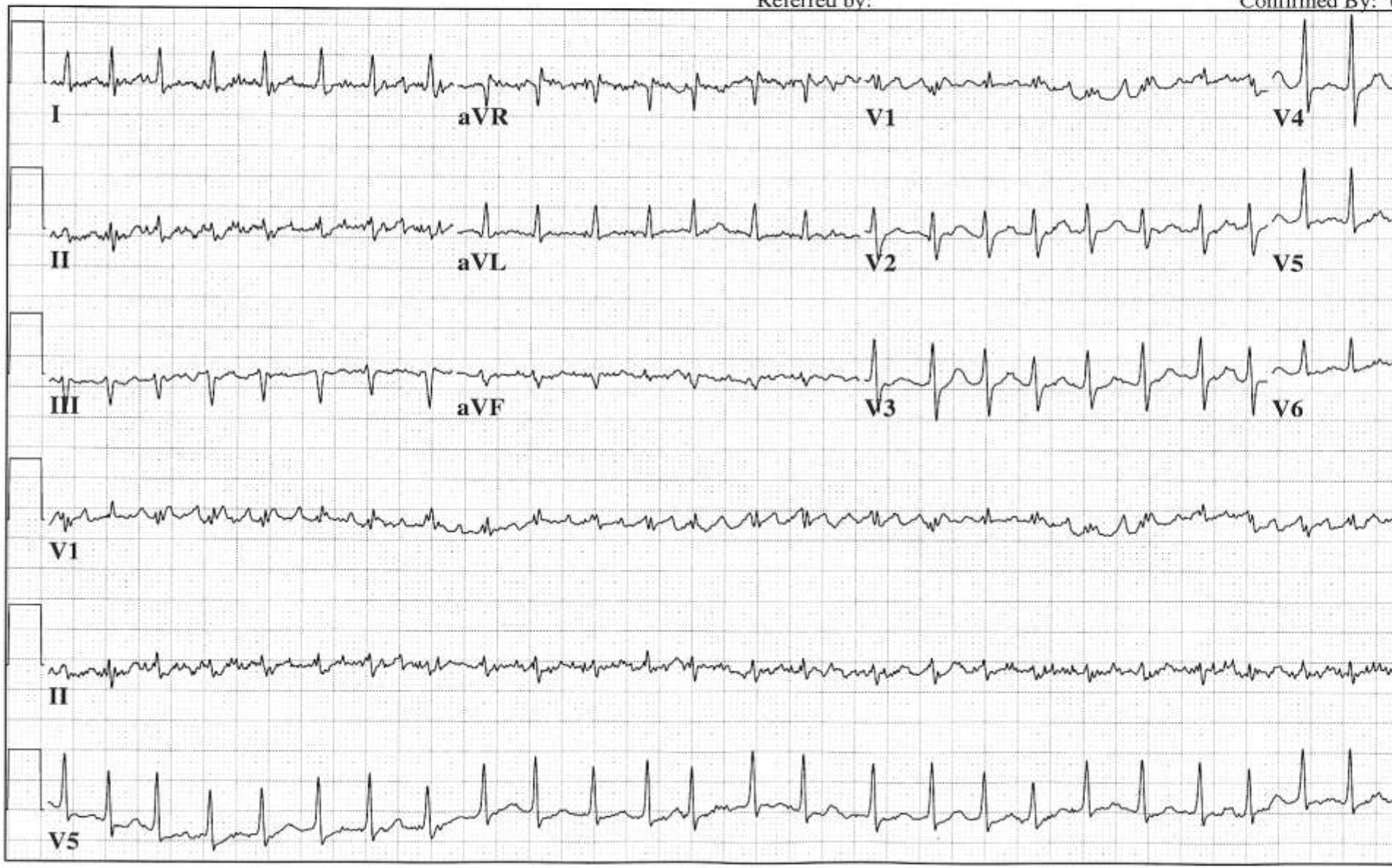
55 y/o Male c/o “palpitations,”
No previous cardiac history

Technician:

Atrial fibrillation has replaced Sinus rhythm
Vent. rate has increased BY 109 BPM ...

Referred by:

Confirmed By:



25mm/s 10mm/mV 40Hz 005C 12SL 235 CID: 2

EID:10 EDT:

ATRIAL FIBRILLATION

CRITICAL CONSIDERATION . . . .

COULD PATIENT HAVE BEEN IN A - FIB FOR AT LEAST 48 HOURS ? ☑ YES

IS PATIENT ON ANTICOAGULANTS ? ☑ NO

☞ **THEN RULE OUT EMBOLI IN ATRIUM WITH EITHER A STAT ECHO or T.E.E. BEFORE CONVERTING TO SINUS RHYTHM !**

ATRIAL FIBRILLATION

CRITICAL CONSIDERATION . . . .

In the REAL world, thrombus has been noted in as little as 6 hours !

COULD PATIENT HAVE BEEN IN A - FIB FOR AT LEAST 48 HOURS ? ☑ YES

IS PATIENT ON ANTICOAGULANTS ? ☑ NO

☞ **THEN RULE OUT EMBOLI IN ATRIUM WITH EITHER A STAT ECHO or T.E.E. BEFORE CONVERTING TO SINUS RHYTHM !**

SVT - UNSTABLE PATIENT (NARROW QRS)

ABC s + GENERAL SUPPORTIVE CARE

(OXYGEN, ECG / VS / SAO2 MONITORING, IV ACCESS)

IMMEDIATE SYNCHRONIZED CARDIOVERSION

- CONSIDER SEDATION
  - ADENOSINE - IF IT DOES NOT DELAY CARDIOVERSION !
- SYNCHRONIZED CARDIOVERSION

REGULAR RHYTHM:	IRREGULAR RHYTHM:
50 - 100 j biphasic	100 - 200 j biphasic

------- monophasic = 200 j ---------

SVT - STABLE PATIENT (NARROW QRS)

ABC s + GENERAL SUPPORTIVE CARE

REGULAR RHYTHM

- VAGAL MANEUVERS
- ADENOSINE 6 mg / 12 mg

IRREGULAR RHYTHM

POSSIBLE ATRIAL FIB or
MULTIFOCAL ATRIAL TACH

- BETA BLOCKERS
- CALCIUM CHANNEL BLOCKER
- TREAT UNDERLYING CAUSE (THE Hs and Ts)
- " EXPERT CONSULTATION "

SVT - STABLE PATIENT

(NARROW QRS !!!!)

ABC s + GENERAL SUPPORTIVE CARE

REGULAR RHYTHM

- VAGAL MANEUVERS
- ADENOSINE 6 mg / 12 mg

IRREGULAR RHYTHM

POSSIBLE ATRIAL FIB or
MULTIFOCAL ATRIAL TACH

- BETA BLOCKERS
- CALCIUM CHANNEL BLOCKER
- TREAT UNDERLYING CAUSE (THE Hs and Ts)
- " EXPERT CONSULTATION "

ST. JOSEPH'S HOSPITAL-

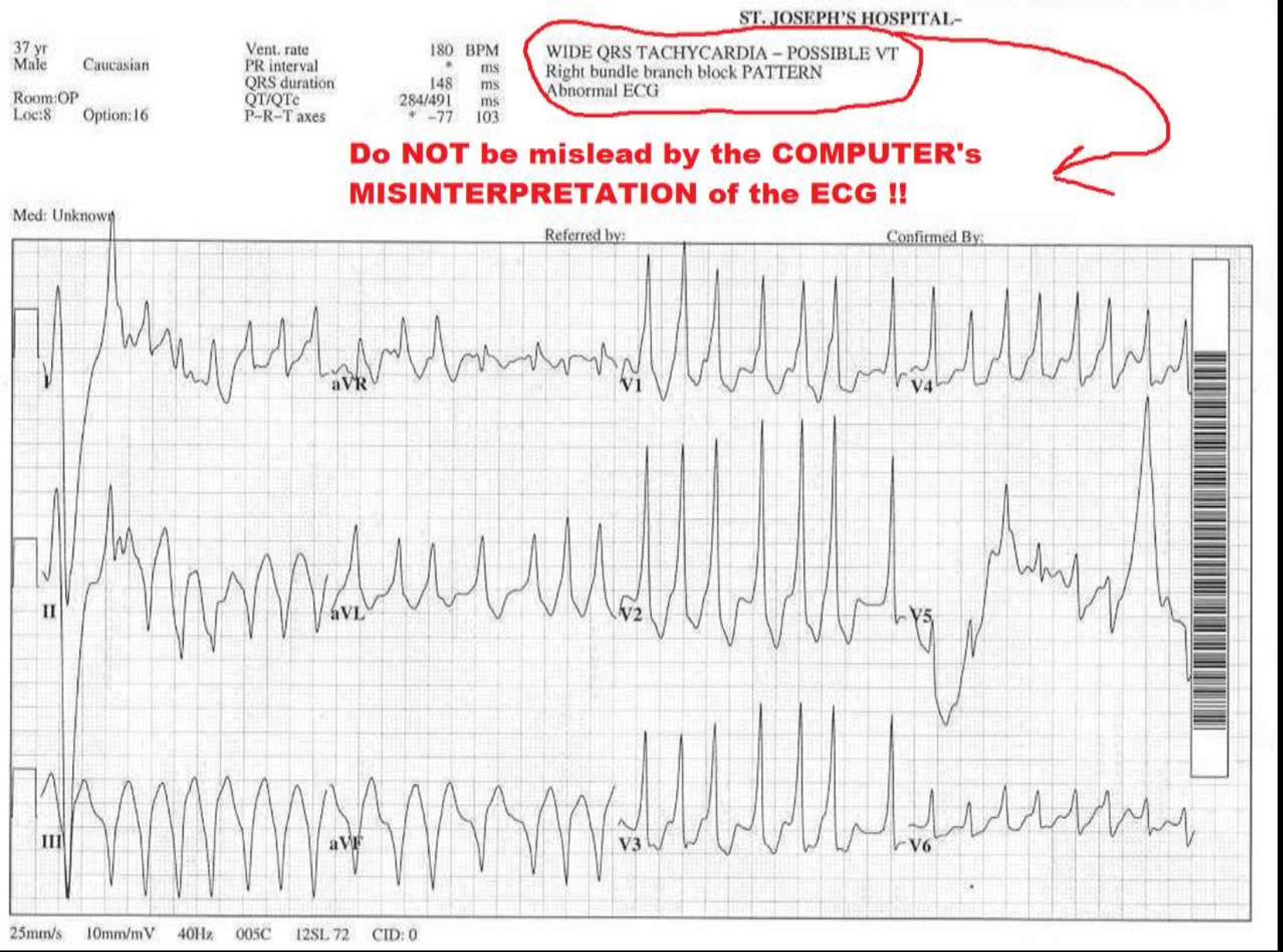
37 yr		Vent. rate	180	BPM
Male	Caucasian	PR interval	*	ms
		QRS duration	148	ms
Room:OP		QT/QTc	284/491	ms
Loc:8	Option:16	P-R-T axes	* -77	103

WIDE QRS TACHYCARDIA – POSSIBLE VT
Right bundle branch block PATTERN
Abnormal ECG

Med: Unknown

Referred by: Confirmed By:

25mm/s 10mm/mV 40Hz 005C 12SL 72 CID: 0



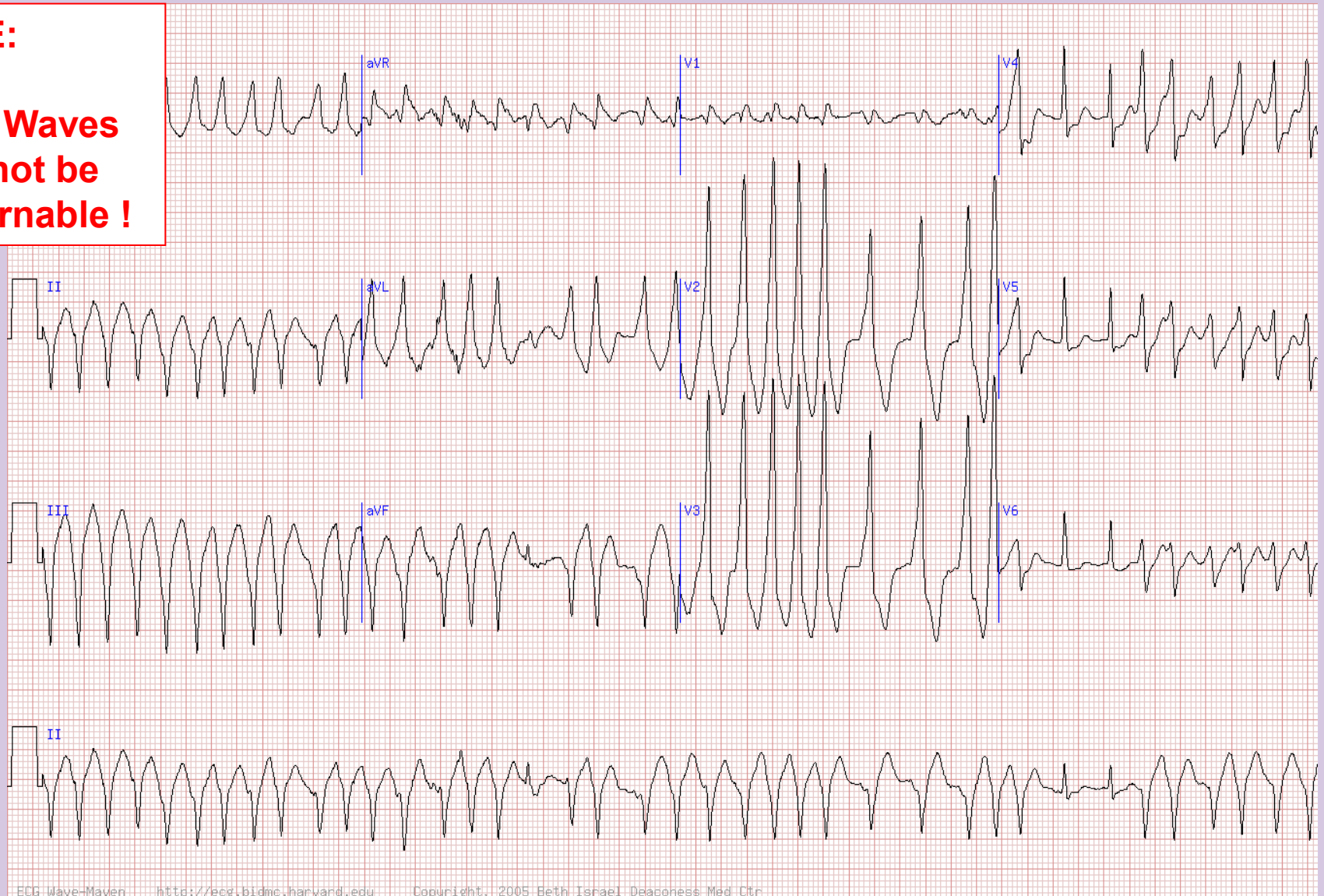
-**NOTE IRREGULARITY OF RHYTHM** - (SUGGESTIVE of A-FIB)
-**WIDE QRS – Consider Bypass Tract** (W-P-W)
-DELTA WAVES ? **(may or may not be visible).**

CHARACTERISTICS of W-P-W with Afib & RVR:

- **WIDE COMPLEX TACHYCARDIA**
- **IRREGULARLY IRREGULAR R – R INTERVALS !!**

NOTE:

Delta Waves may not be discernable !

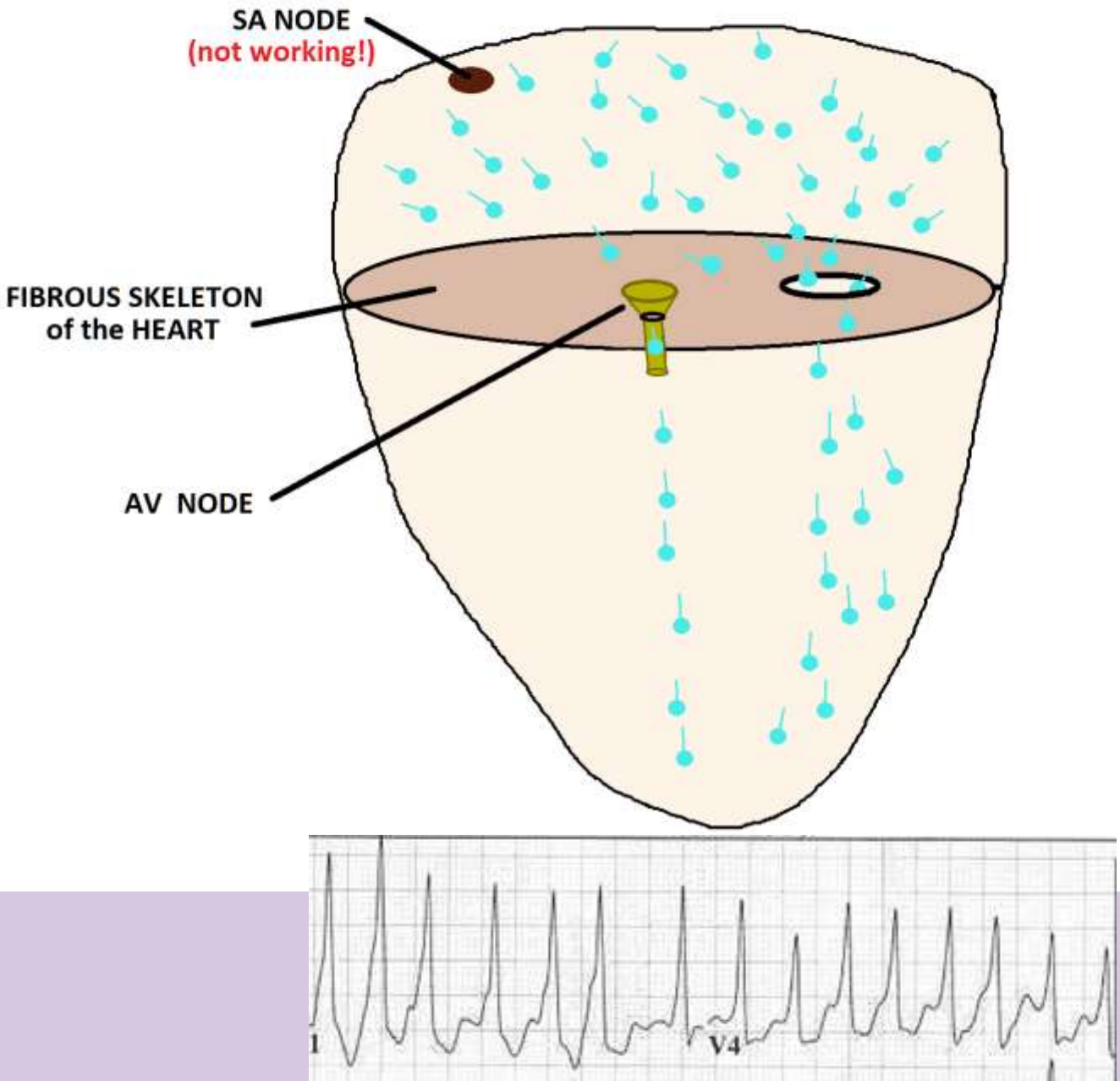


Wolff-Parkinson-White + A-fib

Wolff-Parkinson-White + A-fib = *DISASTER*

NO AV NODAL BLOCKERS
(e.g. ADENOSINE, CALCIUM CHANNEL BLOCKERS)
FOR WIDE COMPLEX TACHYCARDIAS THAT COULD BE ATRIAL FIBRILLATION with Pre-Excitation (W-P-W)

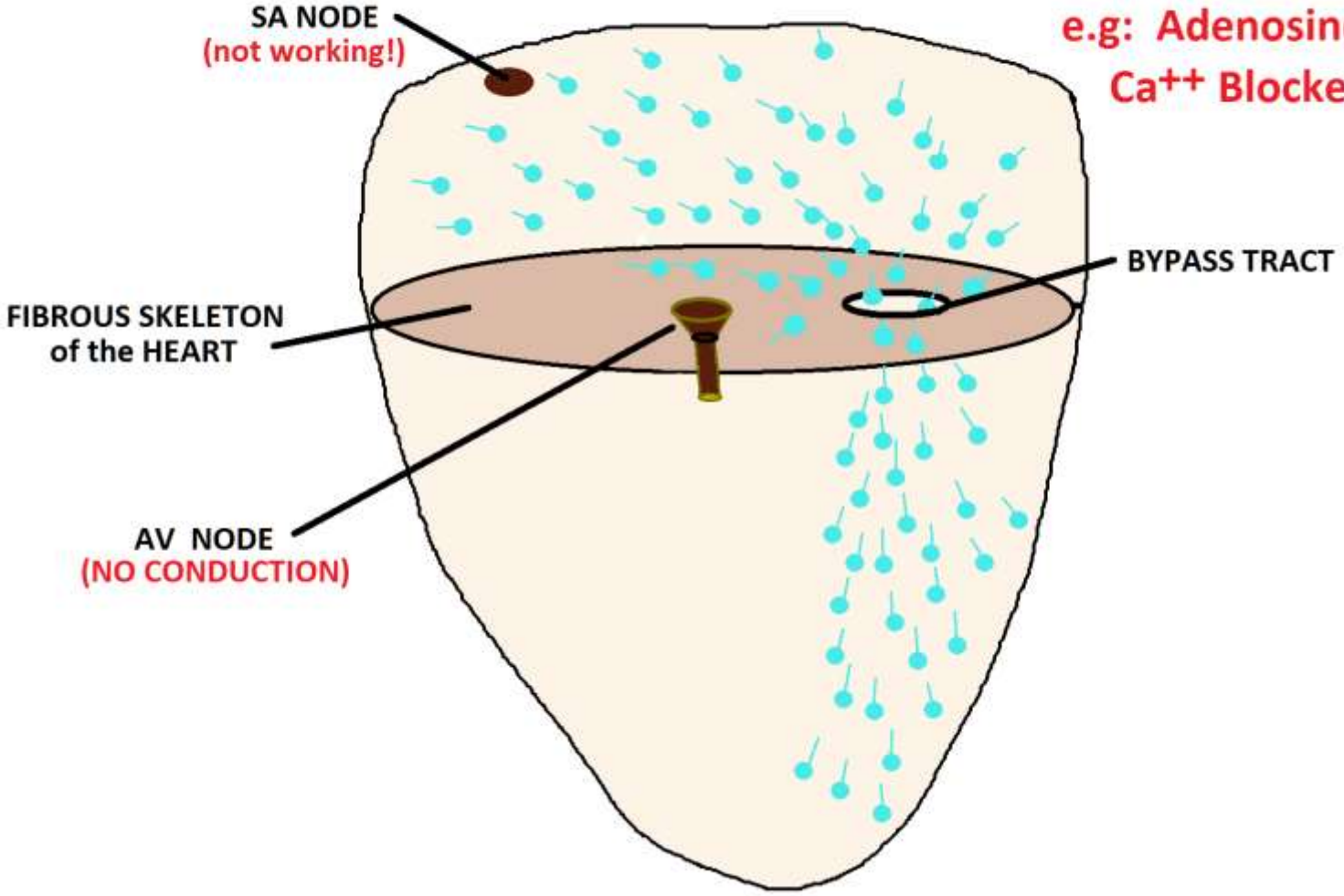
Atrial Fibrillation with Wolff-Parkinson White

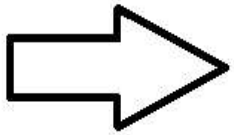


Atrial Fibrillation with Wolff-Parkinson White

with AV NODAL BLOCKING AGENTS

e.g: Adenosine,
Ca^{++} Blockers





AHA ACLS 2015 with ADDED CONSIDERATIONS for WPW with A-FIB and RVR

WIDE COMPLEX TACHYCARDIA (QRS > 120 ms)

MONOPHASIC

ABC s

NO PULSE

GO TO
V - FIB
ALGORITHM !

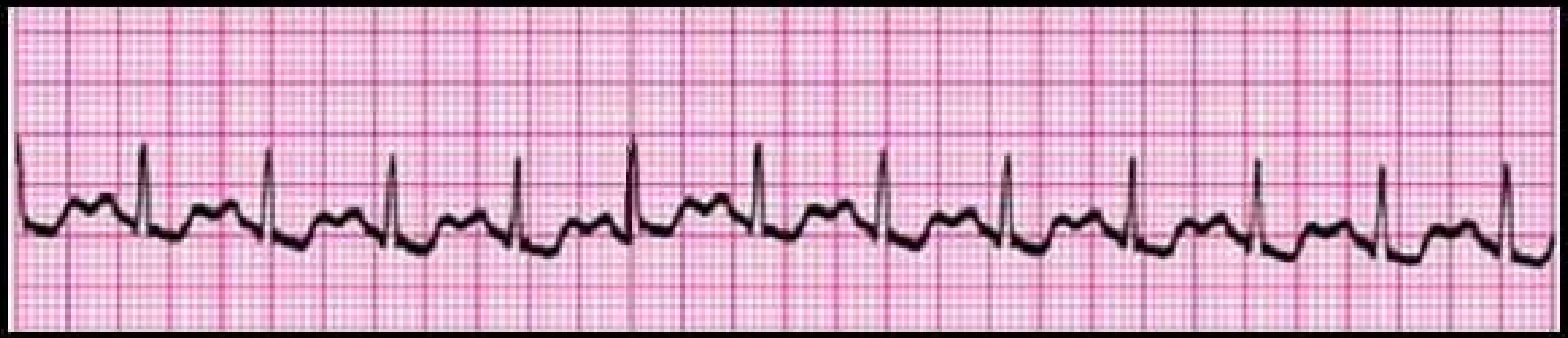
PULSE - UNSTABLE

- IMMEDIATE SYNC. CARDIOVERSION:
  - 120 j biphasic
  - consider sedation
- INCREASE joules
- MEDS:
  - PROCAINAMIDE
  - ~~AMIODARONE~~

PULSE - STABLE

- O2, IV-IO, EKG
- MEDS:
  - ~~ADENOSINE 6-12 (CENTRAL/PERIPHERAL)~~
  - PROCAINAMIDE (20-50mg/min)
  - ~~AMIODARONE~~
  - ILBUTILIDE

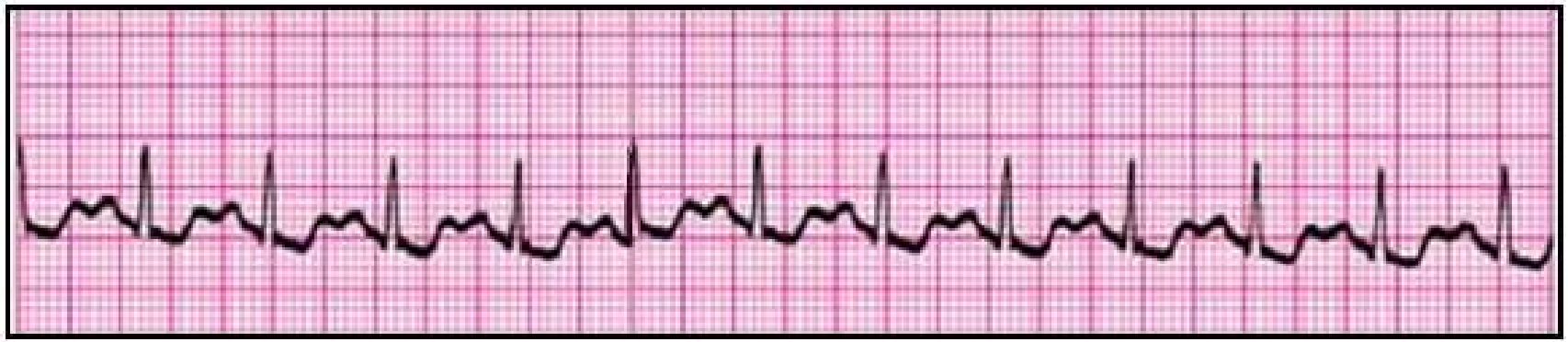
THIS RHYTHM IS:



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P: QRS RATIO -------
QRS INTERVAL -----

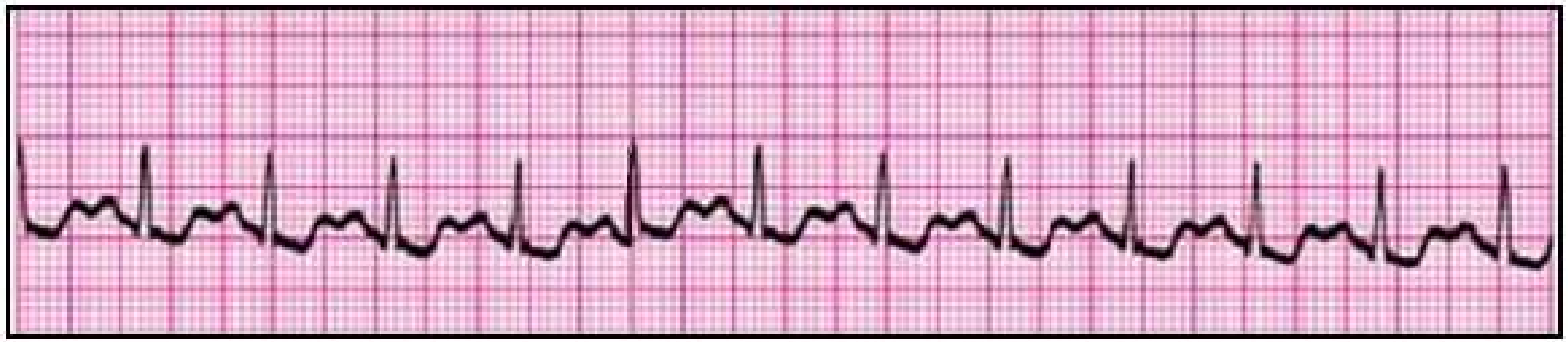
THIS RHYTHM IS: SINUS TACHYCARDIA



MAIN IDENTIFICATION CHARACTERISTIC(S): SINUS RHYTHM, RATE HIGHER THAN 100. (ACLS guidelines: heart rate 100 - 150)

RATE ---------- 100 - 150 (can be > 150)
RHYTHM ---------- REGULAR
P-R INTERVAL ---- NORMAL (120 - 200 ms)
P: QRS RATIO ------ 1 : 1
QRS INTERVAL ---- NORMAL (< 120 ms), (unless Bundle Branch Block present)

THIS RHYTHM IS: SINUS TACHYCARDIA

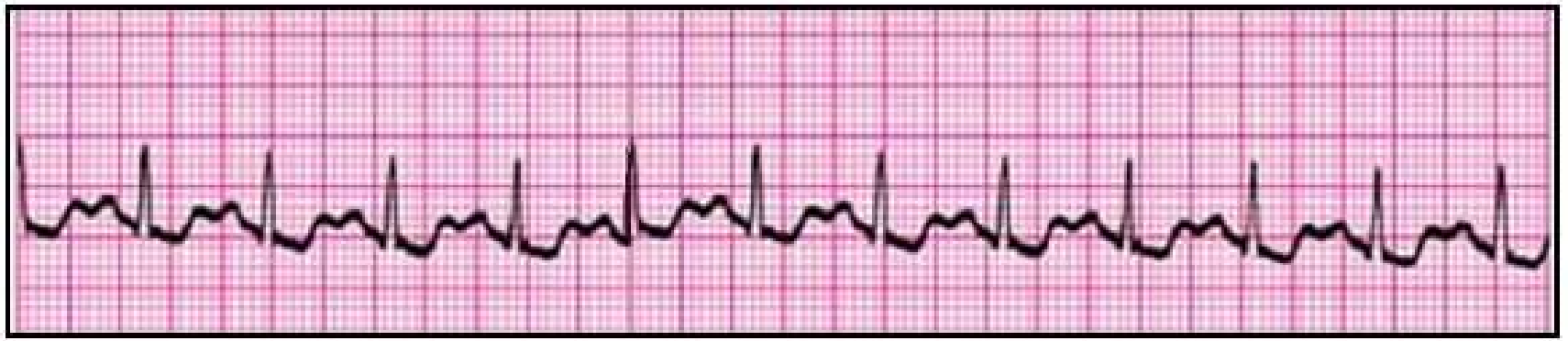


MAIN IDENTIFICATION CHARACTERISTIC(S): SINUS RHYTHM, RATE HIGHER THAN 100. (ACLS guidelines: heart rate 100 - 150)

POTENTIAL PROBLEMS:

- Usually none, unless pt. has severe underlying disease, such as a LOW EF (< 40 %).
- IN MOST CASES, the patient's UNDERLYING PROBLEM is the key issue . . . .

THIS RHYTHM IS: SINUS TACHYCARDIA

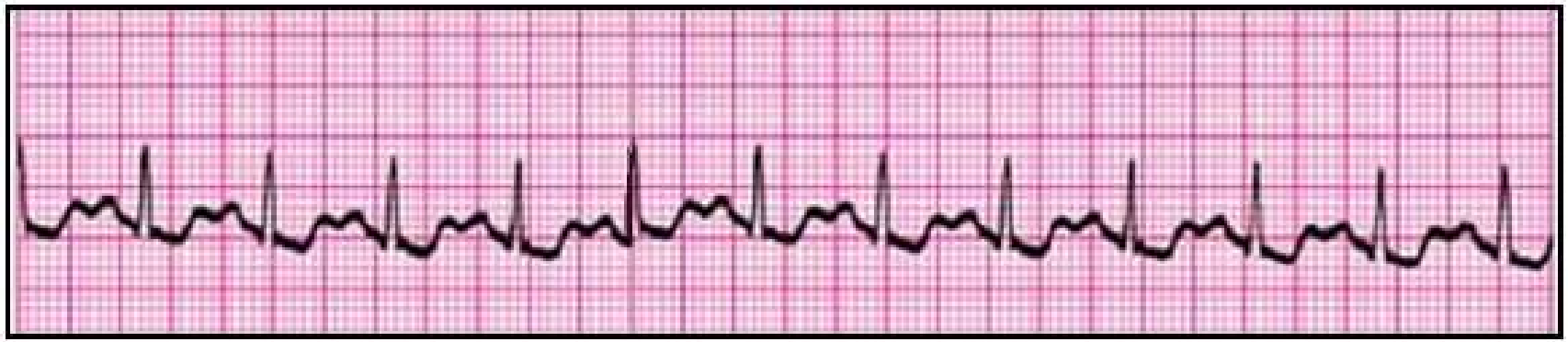


MAIN IDENTIFICATION CHARACTERISTIC(S): SINUS RHYTHM, RATE HIGHER THAN 100. (ACLS guidelines: heart rate 100 - 150)

TREATMENT / INTERVENTIONS :

☞ IN MOST CASES, YOU TREAT THE UNDERLYING CAUSE!

THIS RHYTHM IS: SINUS TACHYCARDIA



WE MUST CONSIDER UNDERLYING CAUSES:	AND TREAT THEM:
ANXIETY / FEAR	CALM PATIENT
HYPOVOLEMIA	
DEHYDRATION	FLUIDS
BLOOD LOSS	STOP BLEEDING
MEDICATION EFFECTS	CONSIDER MEDICAL Tx
OTHER ILLNESS	IDENTIFY & Tx DISORDER

ACLS TACHYCARDIA GUIDELINES

150

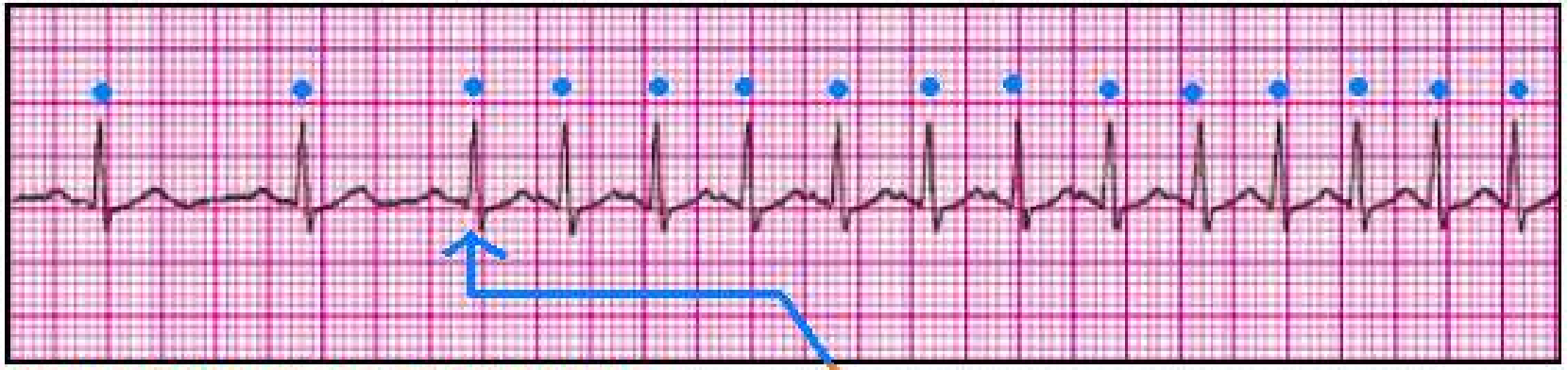
100

SVT

SINUS TACH

NSR

RHTHYM CLUES . . . .

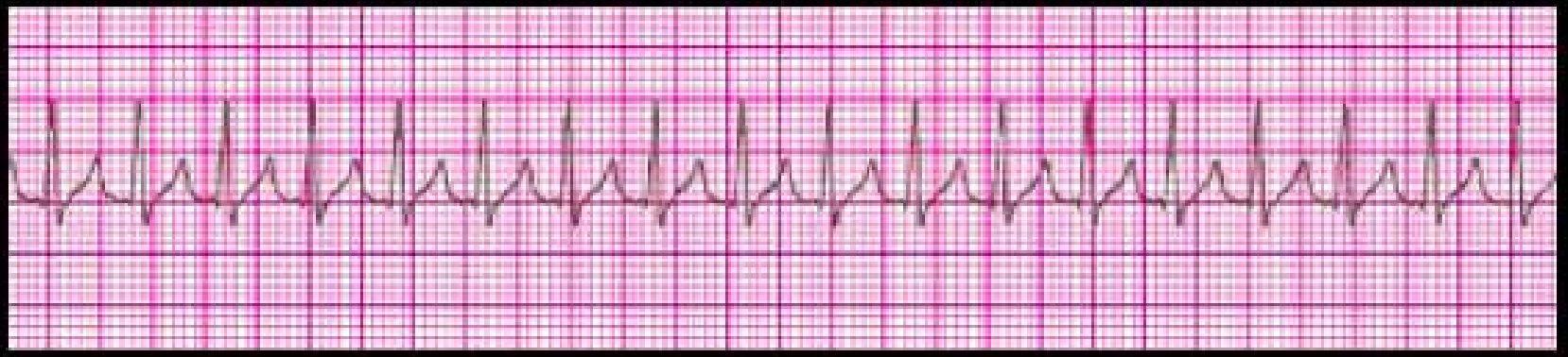


SUPRAVENTRICULAR TACHYCARDIA

SVT is usually PAROXSYMAL -- ie: has a SUDDEN ONSET.

SINUS TACHYCARDIA usually has a " ramp - up " and " ramp - down " period -- a gradual change in HEART RATE.

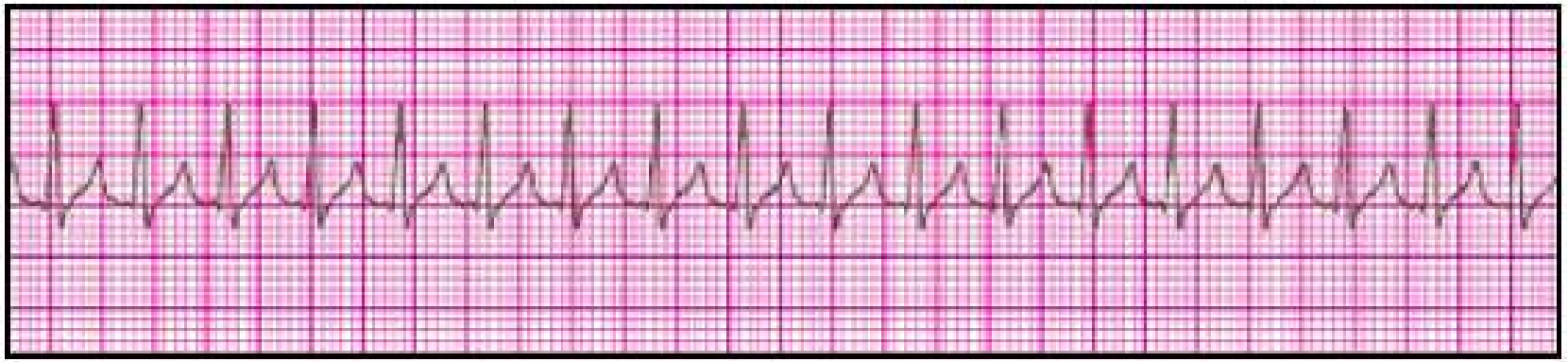
THIS RHYTHM IS:



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL ------
P: QRS RATIO -------
QRS INTERVAL -----

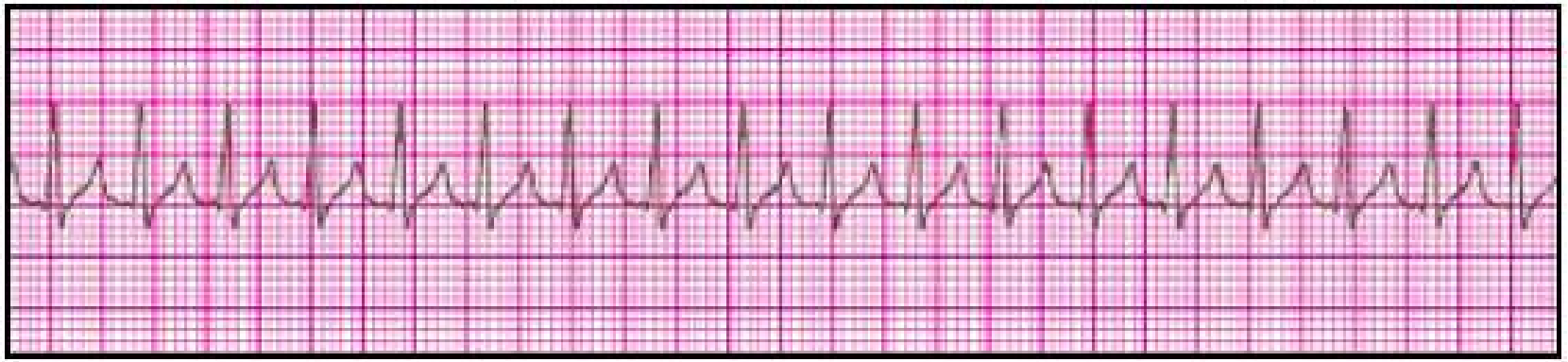
THIS RHYTHM IS: SUPRAVENTRICULAR TACHYCARDIA (SVT)



MAIN IDENTIFICATION CHARACTERISTIC(S): HEART RATE TOO FAST, USUALLY > 150. P WAVES MAY BE "BURIED" IN THE PRECEDING T WAVES. Pt USUALLY C/O "SUDDEN ONSET of HEART RACING," or "PALPITATIONS."

RATE ----------	TACHYCARDIC (usually > 150)	
RHYTHM ----------	REGULAR	
P-R INTERVAL ------	NORMAL or ABNORMAL.	MAY BE IMPOSSIBLE TO SEE DUE TO P WAVE BURIED IN T WAVES
P:QRS RATIO -------	1:1	
QRS INTERVAL -----	NORMAL	

THIS RHYTHM IS: SUPRAVENTRICULAR TACHYCARDIA (SVT)



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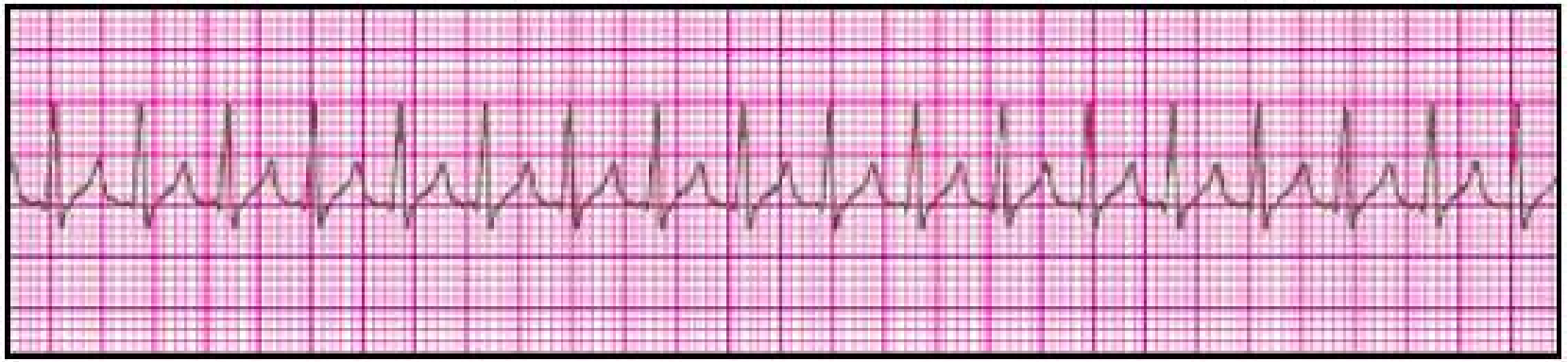
POTENTIAL PROBLEMS:

- HEART MAY BE BEATING TOO FAST TO ALLOW ADEQUATE TIME FOR VENTRICULAR FILLING, RESULTING IN ↓ CARDIAC OUTPUT AND POSSIBLE HYPOTENSION AND SHOCK.
- MYOCARDIAL ISCHEMIA (and therefore CHEST PAIN) IN PATIENTS WITH SIGNIFICANT UNDERLYING HEART DISEASE.

THIS RHYTHM IS: SUPRAVENTRICULAR TACHYCARDIA (SVT)



MAIN IDENTIFICATION CHARACTERISTIC(S): HEART RATE TOO FAST, USUALLY > 150. P WAVES MAY BE "BURIED" IN THE PRECEDING T WAVES. Pt USUALLY C/O "SUDDEN ONSET of HEART RACING," or "PALPITATIONS."

TREATMENT / INTERVENTIONS:

BASED ON WHETHER PATIENT IS STABLE or UNSTABLE . . .

SVT - UNSTABLE PATIENT (NARROW QRS)

ABC s + GENERAL SUPPORTIVE CARE

(OXYGEN, ECG / VS / SAO2 MONITORING, IV ACCESS)

IMMEDIATE SYNCHRONIZED CARDIOVERSION

- CONSIDER SEDATION
  - ADENOSINE - IF IT DOES NOT DELAY CARDIOVERSION !
- SYNCHRONIZED CARDIOVERSION

REGULAR RHYTHM:	IRREGULAR RHYTHM:
50 - 100 j biphasic	100 - 200 j biphasic

------- monophasic = 200 j ---------

SVT - STABLE PATIENT (NARROW QRS)

ABCs + GENERAL SUPPORTIVE CARE

REGULAR RHYTHM

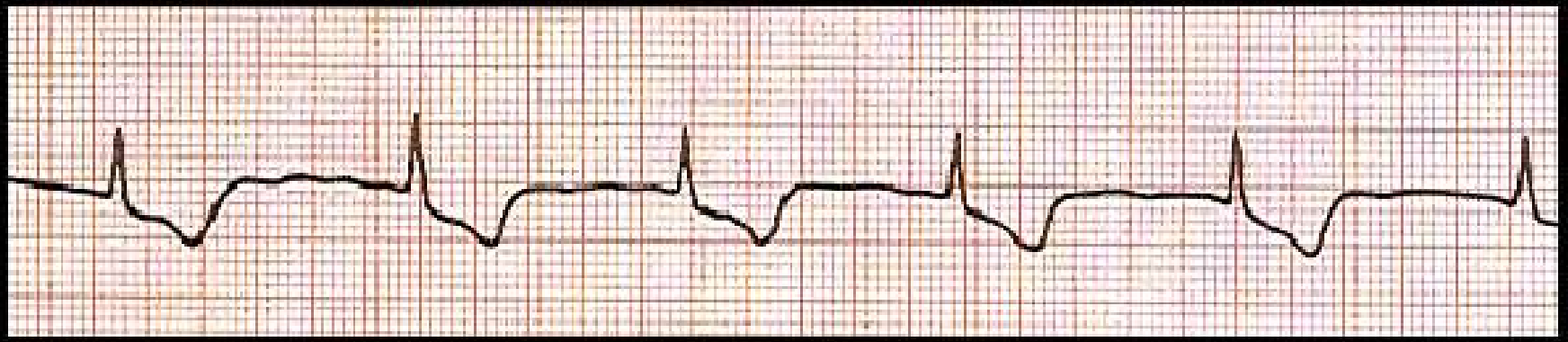
- VAGAL MANEUVERS
- ADENOSINE 6 mg / 12 mg

IRREGULAR RHYTHM

POSSIBLE ATRIAL FIB or
MULTIFOCAL ATRIAL TACH

- BETA BLOCKERS
- CALCIUM CHANNEL BLOCKER
- TREAT UNDERLYING CAUSE (THE Hs and Ts)
- " EXPERT CONSULTATION "

THIS RHYTHM IS: JUNCTIONAL RHYTHM



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P: QRS RATIO -------
QRS INTERVAL -----

THIS RHYTHM IS: JUNCTIONAL RHYTHM

MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ABSENT, or LOCATED JUST AFTER QRS (in S-T seg) or JUST BEFORE QRS (short P-R). WHEN P wave seen, it is INVERTED (upside-down).

RATE ---------- 40-60
RHYTHM ---------- REGULAR
P-R INTERVAL ---- ABSENT or SHORT
P:QRS RATIO ------ 1:1
QRS INTERVAL ---- NORMAL

- HR USUALLY 40-60

THIS RHYTHM IS: JUNCTIONAL RHYTHM

MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ABSENT, or LOCATED JUST AFTER QRS (in S-T seg) or JUST BEFORE QRS (short P-R). WHEN P wave seen, it is INVERTED (upside-down).

- HR USUALLY 40-60

THIS RHYTHM IS: JUNCTIONAL RHYTHM

MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ABSENT, or LOCATED JUST AFTER QRS (in S-T seg) or JUST BEFORE QRS (short P-R). WHEN P wave seen, it is INVERTED (upside-down).

- HR USUALLY 40-60

POTENTIAL PROBLEM(S):

- HR can be TOO FAST or TOO SLOW!! (↓ CARDIAC OUTPUT)

- COULD BE INDICATOR OF MORE SERIOUS UNDERLYING CONDITIONS:
  - M.I.
  - ELECTRICAL SYSTEM DISTURBANCES

THIS RHYTHM IS: JUNCTIONAL RHYTHM

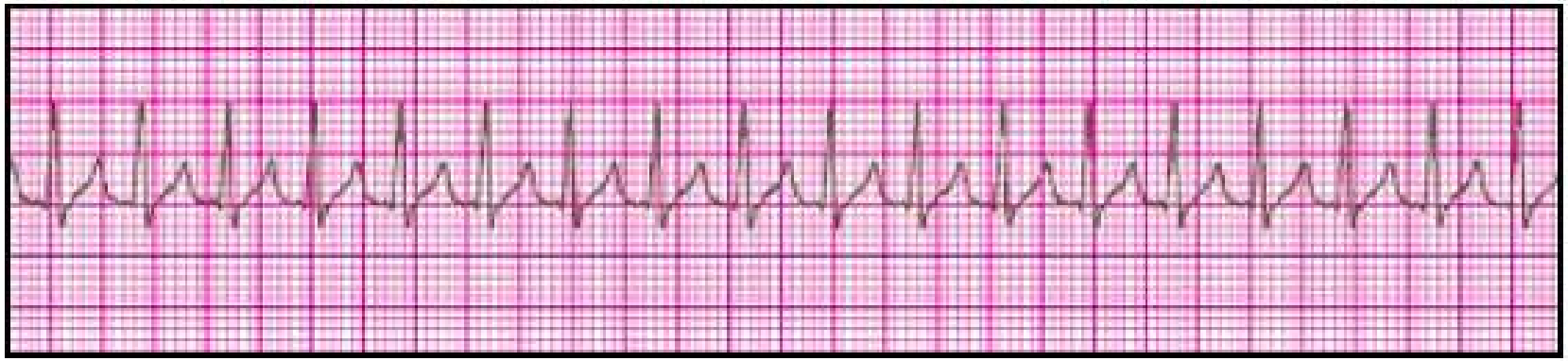
MAIN IDENTIFICATION CHARACTERISTIC(S): P WAVES ABSENT, or LOCATED JUST AFTER QRS (in S-T seg) or JUST BEFORE QRS (short P-R). WHEN P wave seen, it is INVERTED (upside-down).

- HR USUALLY 40-60

TREATMENT / INTERVENTION:

- CORRECT HEART RATE, if pt. symptomatic and HR too SLOW or FAST. (atropine, pacemaker - cardioversion, etc)
- FURTHER DIAGNOSTIC STUDIES to determine *why SINUS NODE not working !!!*

THIS RHYTHM IS: JUNCTIONAL RHYTHM



HEART RATE TOO FAST . . . .

WE MUST CONSIDER UNDERLYING CAUSES:

- AV NODAL RE-ENTRANT TACHYCARDIA (AVNRT)
  (Pt. has DUAL AV NODES)
- WPW ORTHODROMIC TACHYCARDIA

AND TREAT THEM:

- "CHEMICAL" CARDIOVERSION
- SYNCHRONIZED CARDIOVERSION
- ABLATION of "SLOW PATHWAY" (AVNRT) or ACCESSORY BYPASS TRACT (WPW) in EP LAB

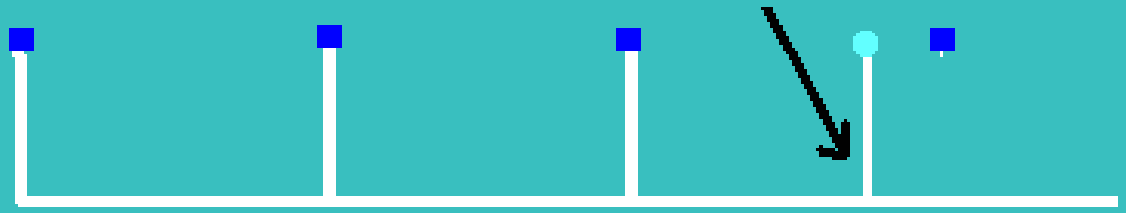
ECTOPY

- ATRIAL
- JUNCTIONAL
- VENTRICULAR

CLASSIFICATIONS OF ECTOPY

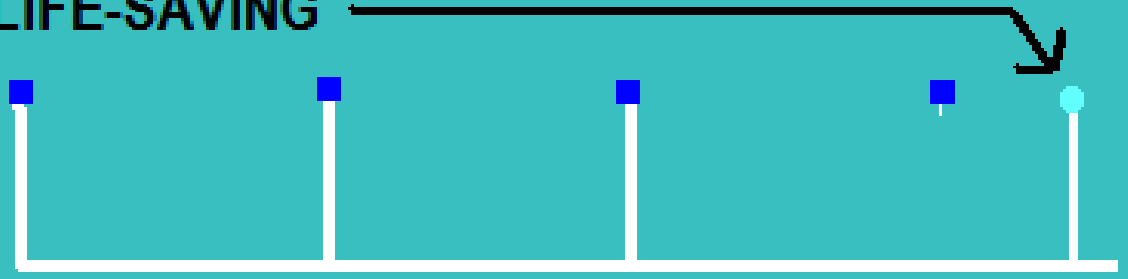
1. PREMATURE

THE ECTOPIC BEAT COMES BEFORE THE NEXT REGULARLY EXPECTED BEAT (IT's EARLY !)



2. END-DIASTOLIC, ESCAPE, or COMPENSATORY

THE ECTOPIC BEAT COMES AFTER A REGULAR BEAT FAILS TO HAPPEN. END-DIASTOLIC BEATS MAY BE LIFE-SAVING



CAUSES OF ECTOPY

1. PREMATURE

- HYPOXIA
- IRRITABILITY
- CHANGES IS SYMPATHETIC / PARASYMPATHETIC TONE
- DAMAGE TO MYOCARDIUM CAUSING CHANGES IN AUTOMATICITY (such as from MI / NECROSIS, etc.).
- MEDICATIONS / SUBSTANCES
- ELECTROLYTES

2. END-DIASTOLIC, ESCAPE, or COMPENSATORY

- FAILUARE OF SA NODE
- FAILURE OF AV NODE

WHEN THESE FAIL TO PRODUCE OR PROPOGATE AN IMPULSE, ESCAPE FOCI MAY TAKE OVER PACING THE HEART BY PRODUCING END-DIASTOLIC BEATS

SIMPLY STATED,

1. **PREMATURE BEATS ----** **BAD**

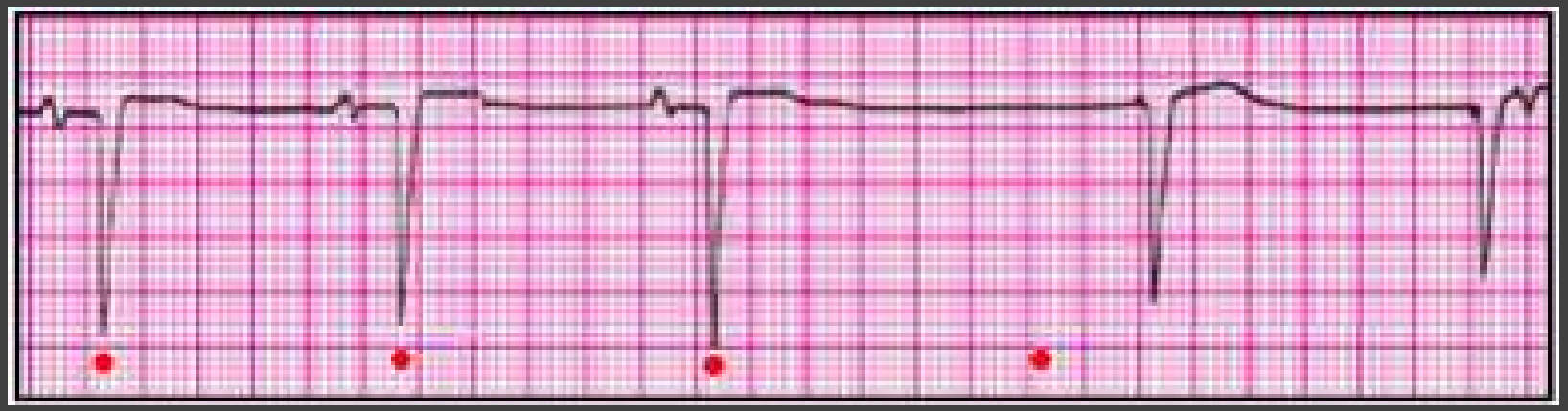
IN SOME CASES WE MUST ELIMINATE PREMATURE BEATS TO PROTECT THE PATIENT

2. **END-DIASTOLIC or ESCAPE BEATS ----** **GOOD**

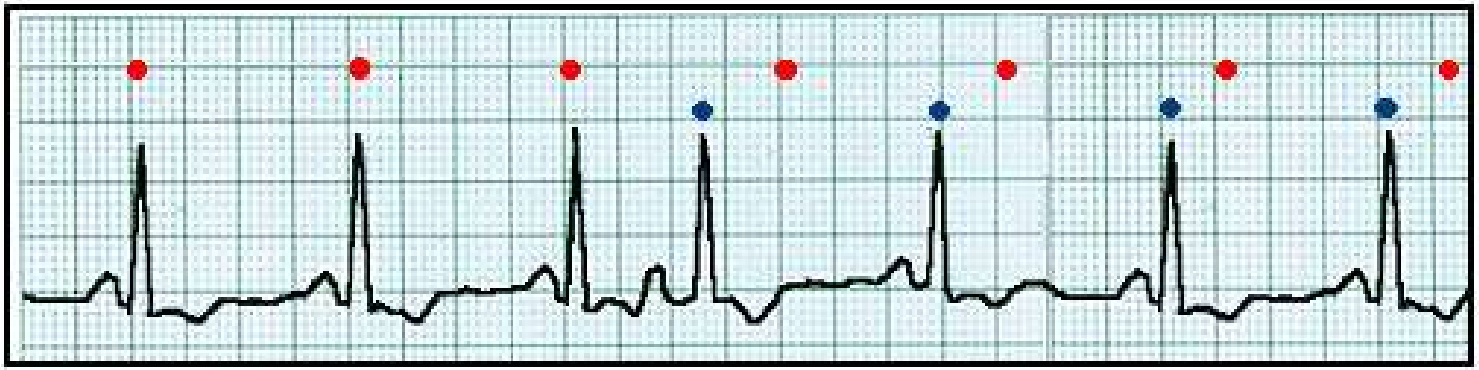
ELIMINATION OF END-DIASTOLIC BEATS COULD BE DEADLY

Premature

End Diastolic (escape)



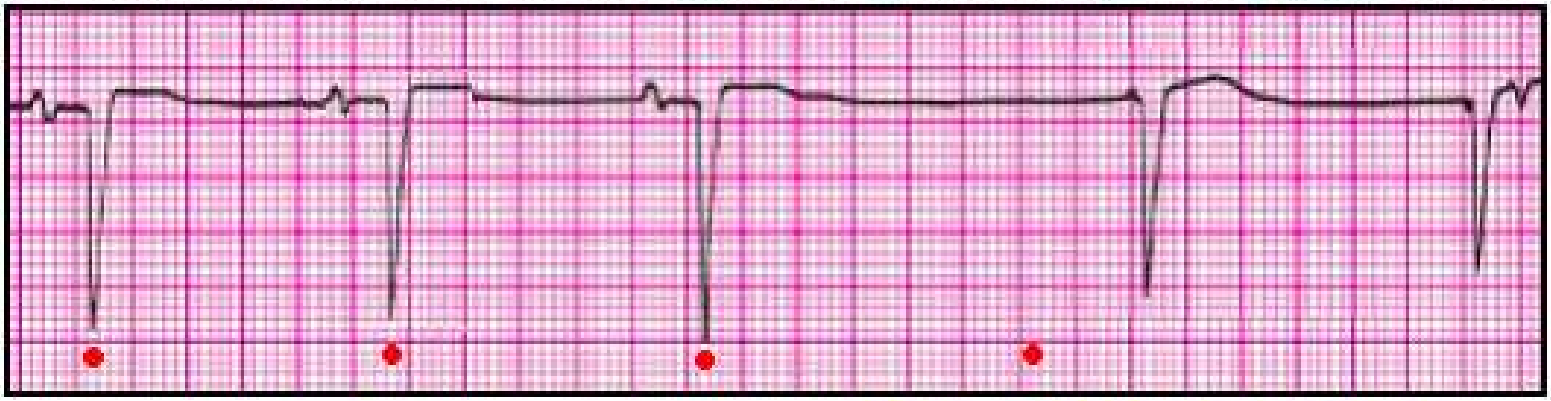
THIS RHYTHM IS: NSR with PAC



MAIN IDENTIFICATION CHARACTERISTIC(S): PREMATURE COMPLEX, NORMAL QRS; P-WAVE DIFFERENT THAN OTHERS; P-R INTERVAL FREQUENTLY LONGER or SHORTER THAN NORMAL; NO COMPENSATORY PAUSE

RATE ---------- NORMAL
RHYTHM ---------- IRREGULAR
P-R INTERVAL ---- NORMAL (except PAC may be LONGER or SHORTER)
P:QRS RATIO ------ 1:1
QRS INTERVAL ---- NORMAL (unless BBB present)

THIS RHYTHM IS: NSR with JUNCTIONAL ESCAPE BEAT



MAIN IDENTIFICATION CHARACTERISTIC(S): BEAT OCCURS LATER THAN NEXT EXPECTED BEAT; QRS IS NORMAL; P WAVE ABSENT or JUST IN FRONT OF or JUST AFTER QRS and is USUALLY INVERTED.

RATE ---------- NORMAL
RHYTHM ---------- IRREGULAR (because of ESCAPE BEAT)
P-R INTERVAL ---- NORMAL for NSR / ABSENT or SHORT for ESCAPE BEAT
P:QRS RATIO ------ 1:1 for NSR / 0:1 or 1:1 for ESCAPE BEAT
QRS INTERVAL ---- NORMAL (unless BBB present)

THIS RHYTHM IS:

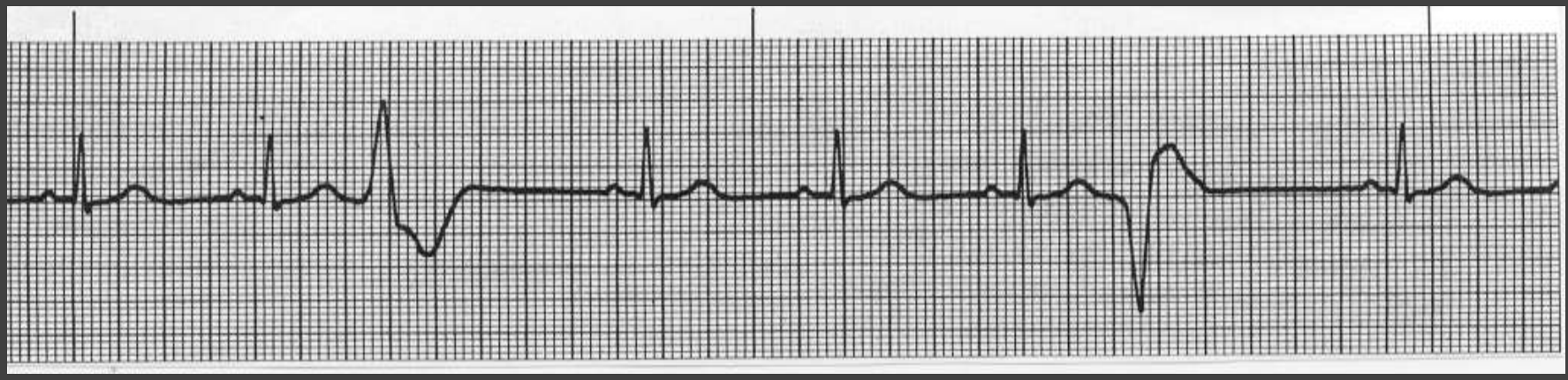
MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P: QRS RATIO -------
QRS INTERVAL -----

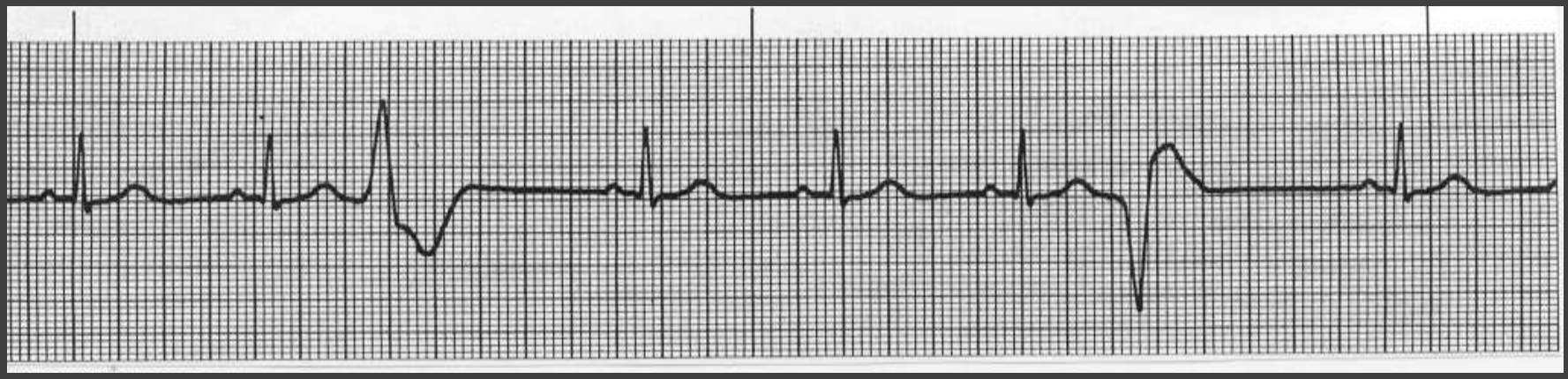
THIS RHYTHM IS: NSR with UNIFOCAL PVCs

MAIN IDENTIFICATION CHARACTERISTIC(S): ECTOPIC BEATS ARE ***PREMATURE***, AND WIDE (> 120 ms); COMPLEXES MAY BE OF ANY SHAPE or DEFLECTION, BUT ALL HAVE SAME APPEARANCE; THERE IS A COMPENSATORY PAUSE

RATE ----------	NORMAL
RHYTHM ----------	IRREGULAR (due to PVCs)
P-R INTERVAL ------	NSR BEATS - NORMAL (120 - 200 ms) PVCs - N/A
P: QRS RATIO -------	NSR BEATS - 1 : 1 PVCs - N/A
QRS INTERVAL ------	NSR BEATS < 120 ms PVCs > 120 ms



Multifocal PVCs



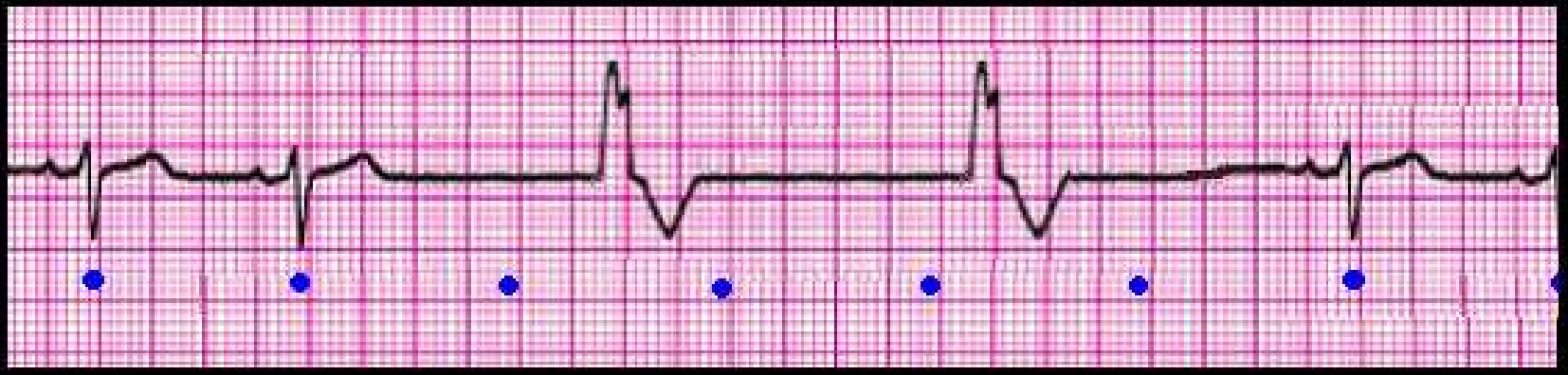
Multifocal Couplet PVCs

-- CRITICAL ECG ALERT --

-Immediately check patient
-Notify next "higher up" in chain of command

1. **Heart rate LESS THAN 50 or GREATER THAN 150**
2. **QT INTERVAL prolonged (usually not emergent but let Dr. know)**
3. **2nd degree type II or 3rd degree HEART BLOCK**
4. **SINUS ARREST with periods of ASYSTOLE**
5. **NEW ONSET of any DYSRHYTHMIA**
6. **PVCs that are MULTIFOCAL, 2 or MORE TOGETHER, R on T, greater than 6 per minute,**

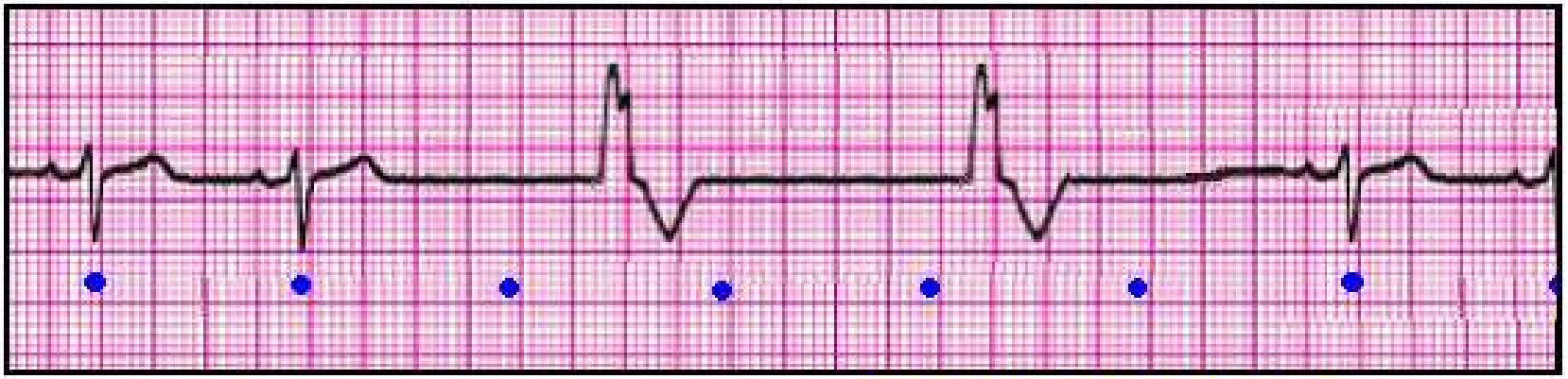
THIS RHYTHM IS:



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P: QRS RATIO -------
QRS INTERVAL -----

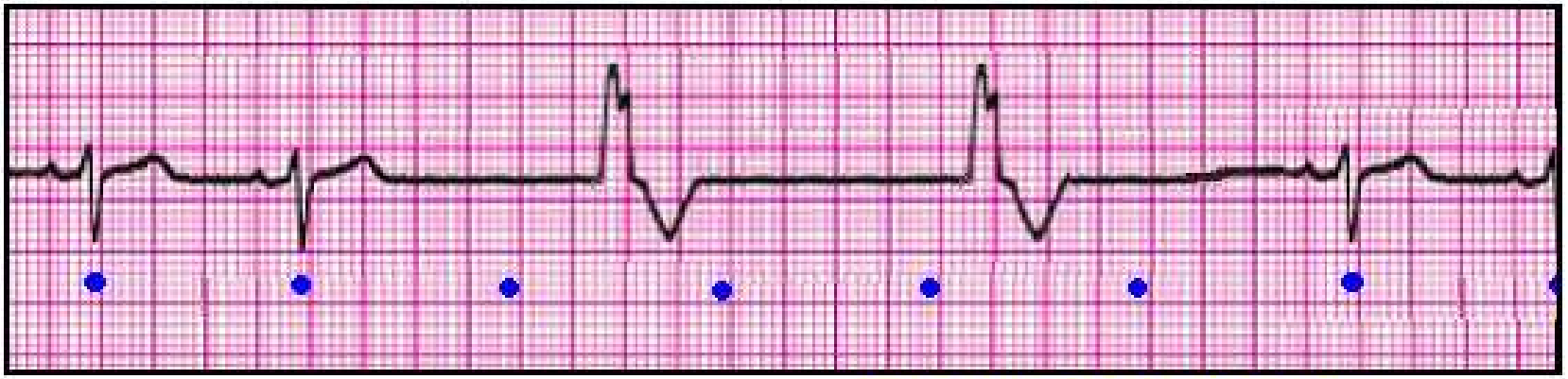
THIS RHYTHM IS: SINUS ARREST w/ VENT. ESCAPE



MAIN IDENTIFICATION CHARACTERISTIC(S): END DIASTOLIC (ESCAPE) BEAT(S); COMPLEXES WIDER THAN 120 ms ; MAY BE UNIFOCAL or MULTIFOCAL; MAY or MAY NOT HAVE GOOD PULSE w/ COMPLEXES

RATE	USUALLY < 40
RHYTHM	VENT. ESCAPE: USUALLY REGULAR
P-R INTERVAL	VENT. ESCAPE: N/A
P:QRS RATIO	VENT. ESCAPE: N/A
QRS INTERVAL	VENT. ESCAPE: > 20 ms

THIS RHYTHM IS: SINUS ARREST w/ VENT. ESCAPE



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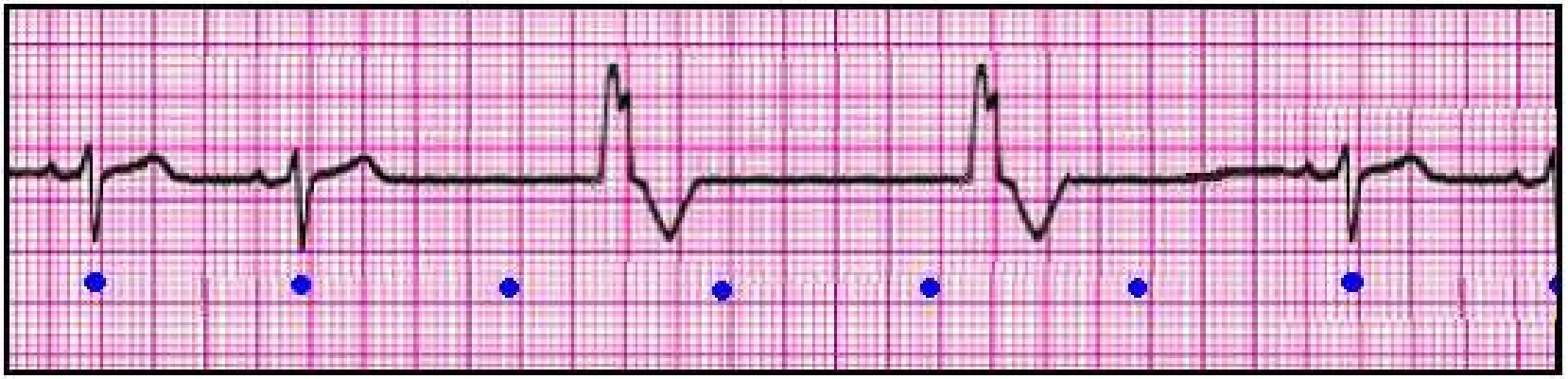
PRESENTING PROBLEM(S):

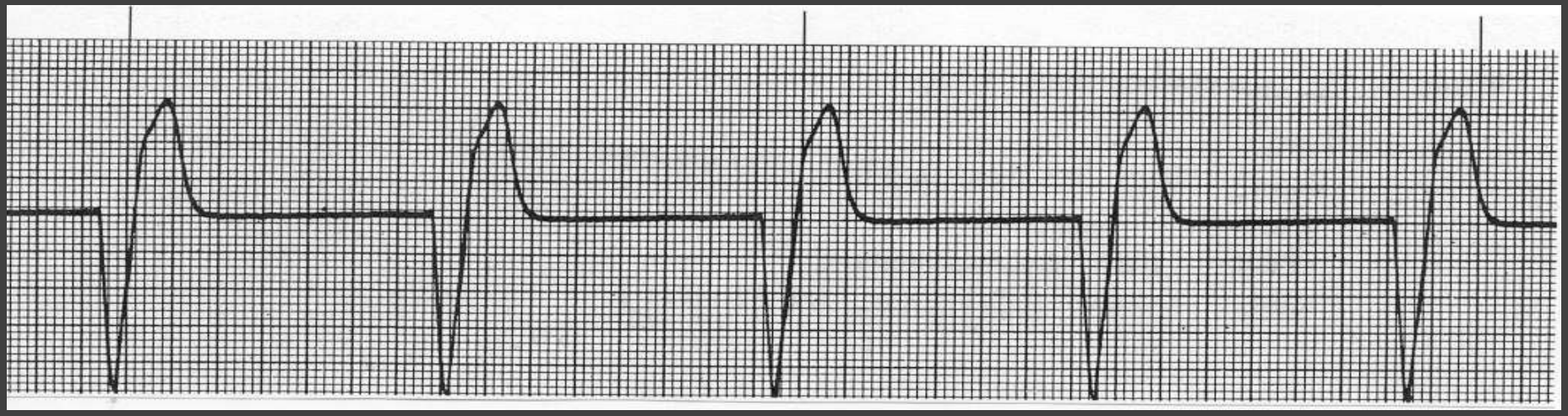
- PROBLEM IS WITH UNDERLYING REASON WHY SINUS NODE and AV NODE HAVING PERIODS OF ARREST.
- THE VENTRICULAR ESCAPE COMPLEXES MAY BE VERY SLOW, BUT MAY BE ONLY THING KEEPING PATIENT PERFUSED DURING PERIODS OF SINUS/AV ARREST.

THIS RHYTHM IS: SINUS ARREST w/ VENT. ESCAPE

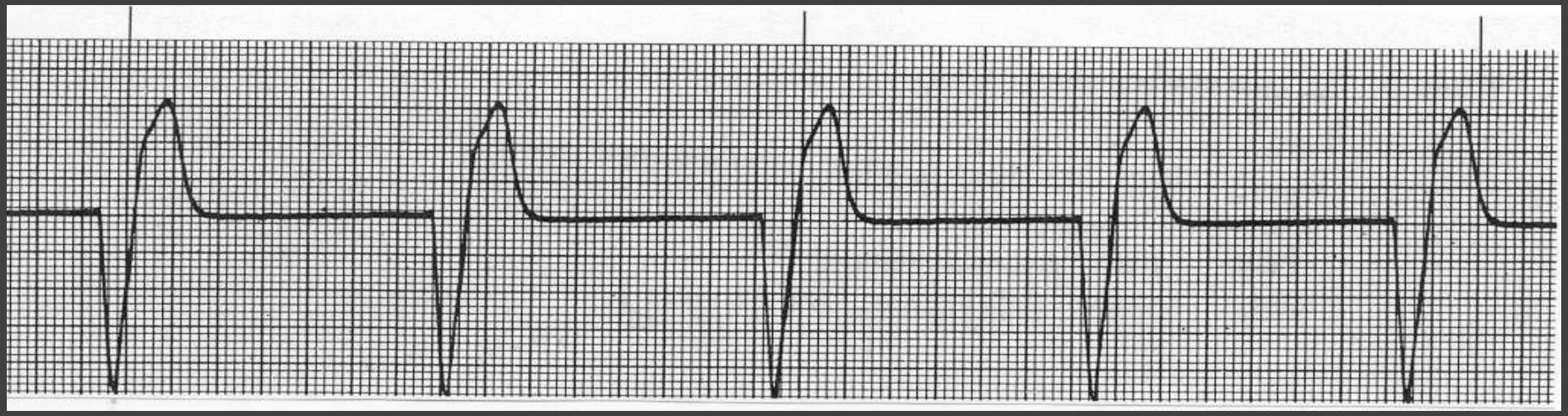


TREATMENT / INTERVENTION (S):

- EMERGENT TREATMENT IS TRANSCUTANEOUS PACING.
- TREAT UNDERLYING CAUSE OF SINUS / AV ARREST
- *DO NOT* ATTEMPT TO SUPRESS VENTRICULAR ESCAPE BEATS WITHOUT HAVING BACK-UP TRANSCUTANEOUS / TRANSVENOUS PACING ATTACHED TO PATIENT !!!



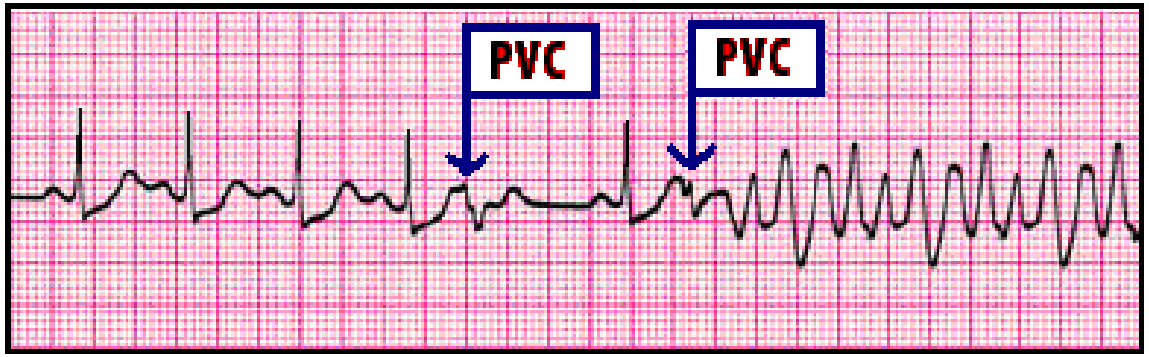
Accelerated Idioventricular Rhythm (AIVR)



No P waves
Wide QRS Complexes
Rate usually "Ventricular" - 40 or less

This may be the only RHYTHM keeping the Patient alive.

THIS RHYTHM IS: NSR with R on T PHENONEMON

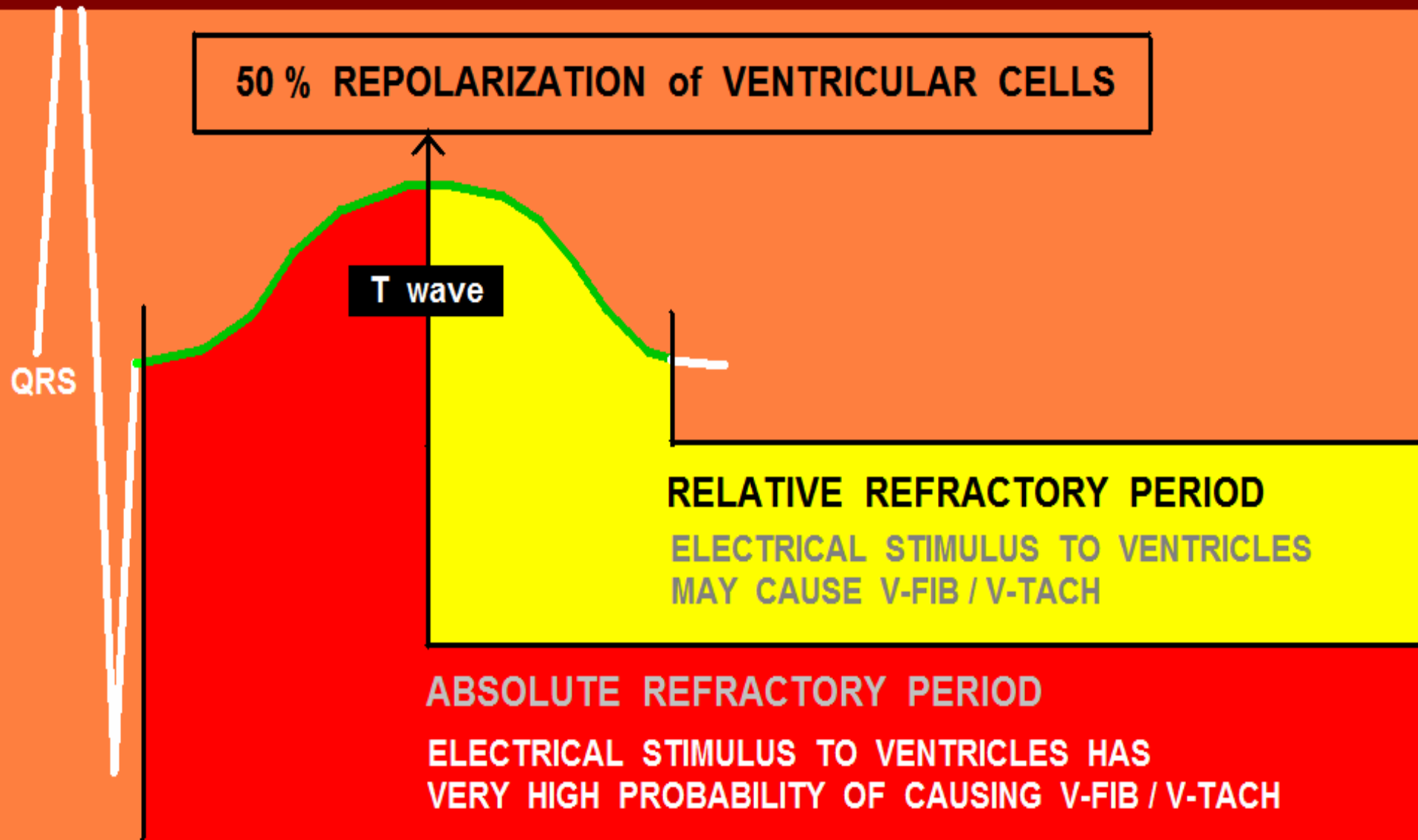


MAIN IDENTIFICATION CHARACTERISTIC(S): ECTOPIC BEATS ARE WIDE (> 120 ms); ALL APPEAR TO HAVE SAME SHAPE and DEFLECTION ; THERE IS A COMPENSATORY PAUSE

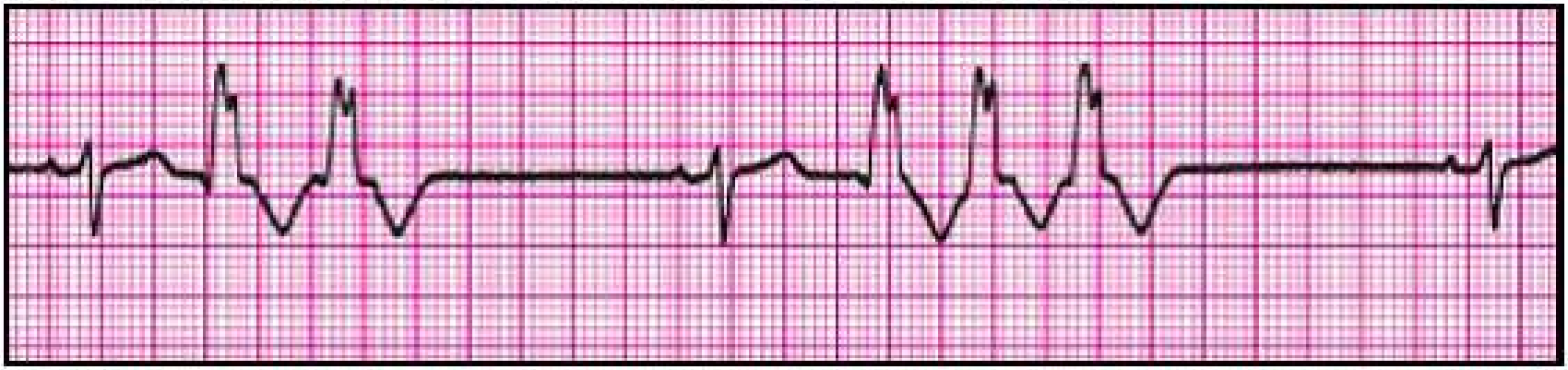
POTENTIAL PROBLEMS (S):

- THE UNDERLYING REASON PVCs ARE PRESENT COULD BE A CRITICAL ISSUE . . .
- PVCs MAY HAVE A WEAKER PULSE, or NO PULSE
- PVCs DURING REFRACTORY PERIOD COULD CAUSE V-FIB
- PVCs COUPLED TOGETHER COULD PRECIPITATE V-TACH

CARDIAC ANATOMY and PHYSIOLOGY "101"



THIS RHYTHM IS: NSR w/ COUPLET and RUN of V-TACH

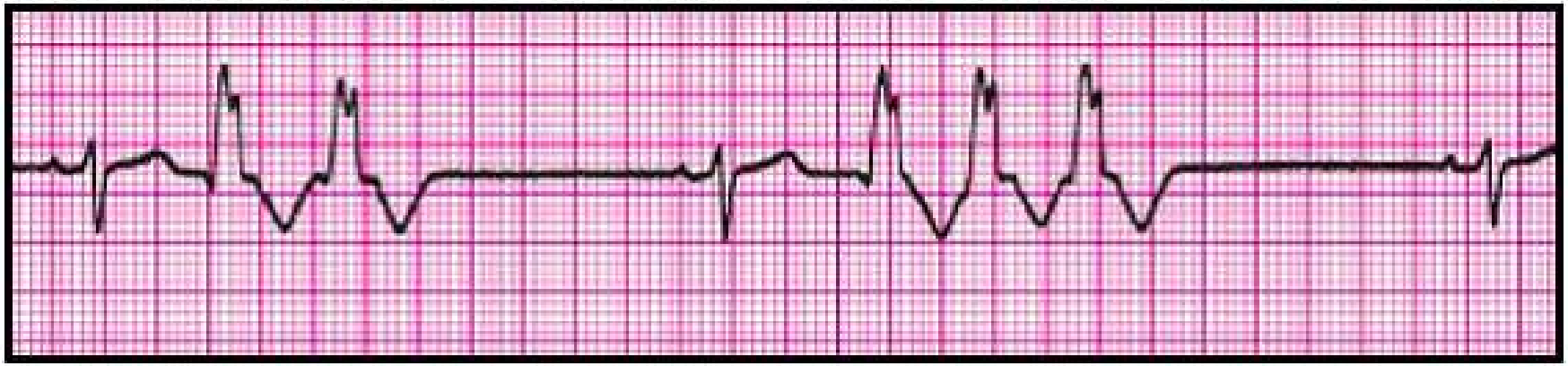


MAIN IDENTIFICATION CHARACTERISTIC(S): ECTOPIC BEATS ARE WIDE (> 120 ms); PVCs ARE COUPLED TOGETHER (2 = "COUPLET"), (3 or more = RUN OF V-TACH)

POTENTIAL PROBLEMS (S):

- THE UNDERLYING REASON PVCs ARE PRESENT COULD BE A CRITICAL ISSUE . . .
- PVCs MAY HAVE A WEAKER PULSE, or NO PULSE
- PVCs DURING REFRACTORY PERIOD COULD CAUSE V-FIB
- PVCs COUPLED TOGETHER COULD PRECIPITATE V-TACH

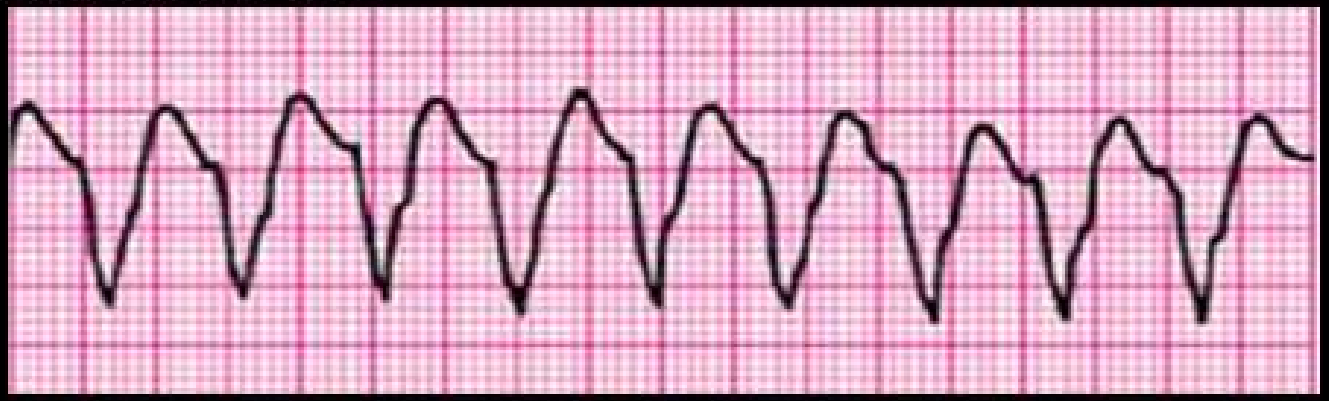
THIS RHYTHM IS: NSR w/ COUPLET and RUN OF V-TACH



TEXTBOOK STANDARDS:

- 3 or more PVCs IN A ROW = RUN OF VENTRICULAR TACHYCARDIA
- DEFINITION OF "SUSTAINED V-TACH" VARIES FROM "3 or more BEATS IN A ROW" to "MORE THAN 30 SECONDS OF V-TACH." ("Electrophysiologic Testing," by: Richard N. Fogoros, MD, p. 179)
- ACLS 2006 Standards DO NOT define WHEN you treat VENTRICULAR ECTOPY, or attempt to define when "RUNS OF PVCs" are to be considered as "VENTRICULAR TACHYCARDIA."

THIS RHYTHM IS:



MAIN IDENTIFICATION CHARACTERISTIC(S):

RATE ----------
RHYTHM ----------
P-R INTERVAL -----
P: QRS RATIO -------
QRS INTERVAL -----

THIS RHYTHM IS: MONOMORPHIC V-TACH

MAIN IDENTIFICATION CHARACTERISTIC(S): WIDE QRS COMPLEXES (> 120 ms)
HR USUALLY BETWEEN 150 - 200; ALL QRS COMPLEXES APPEAR SAME IN SHAPE and DEFELCTION; IF P WAVES SEEN, DISASSOTIATED w/ QRS

RATE ---------- > 100 (usually 150 - 200)
RHYTHM ---------- REGULAR
P-R INTERVAL ---- N/A
P: QRS RATIO ------ N/A
QRS INTERVAL ---- > 120 ms

-- CRITICAL ECG ALERT --

-Immediately check patient
-Notify next "higher up" in chain of command

1. **Heart rate LESS THAN 50 or GREATER THAN 150**
2. **QT INTERVAL prolonged (usually not emergent but let Dr. know)**
3. **2nd degree type II or 3rd degree HEART BLOCK**
4. **SINUS ARREST with periods of ASYSTOLE**
5. **NEW ONSET of any DYSRHYTHMIA**
6. **PVCs that are MULTIFOCAL, 2 or MORE TOGETHER, R on T, greater than 6 per minute,**
7. **V-TACH, or WIDE QRS TACHYCARDIA of unknown origin**

WIDE COMPLEX TACHYCARDIA (QRS > 120 ms)

MONOPHASIC

ABC s

NO PULSE

GO TO
V - FIB
ALGORITHM !

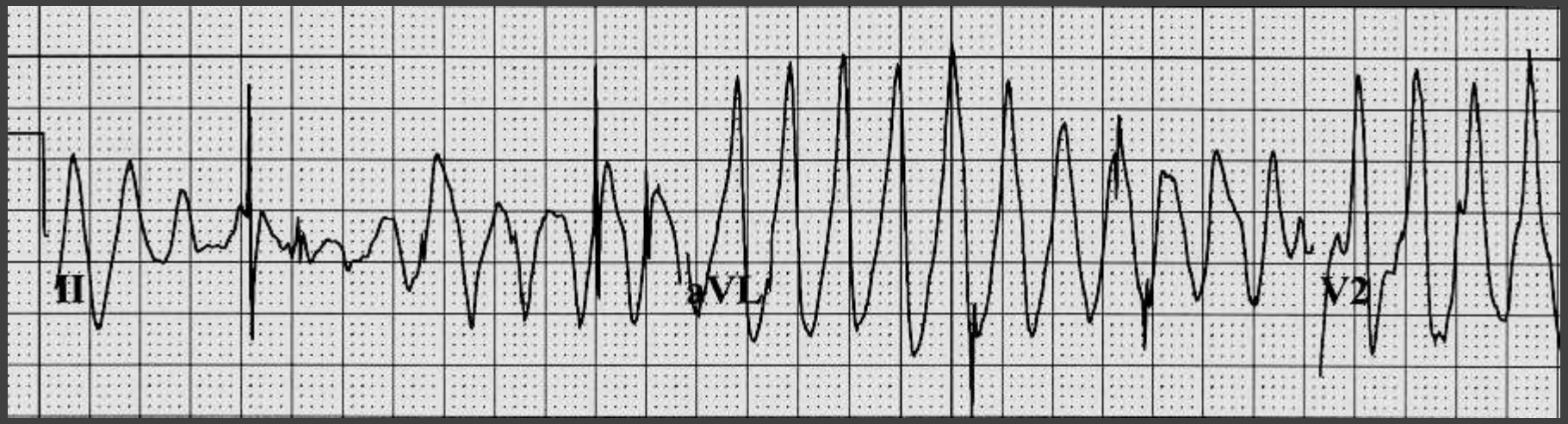
PULSE - UNSTABLE

- IMMEDIATE SYNC. CARDIOVERSION:
  - 100 j biphasic
  - consider sedation
- INCREASE joules
- MEDS:
  - -PROCAINAMIDE
  - -AMIODARONE

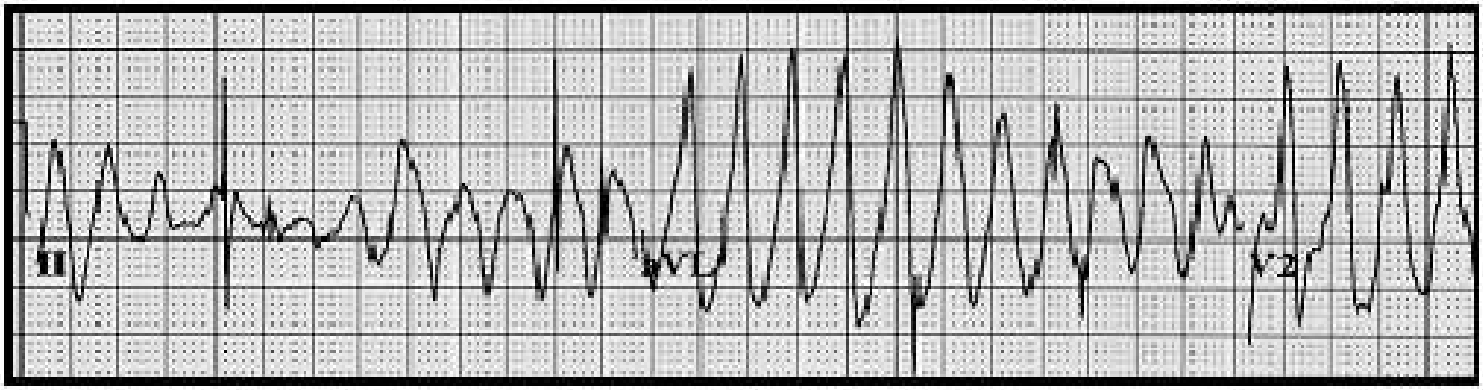
PULSE - STABLE

- O2, IV-IO, EKG
- MEDS:
  - ADENOSINE 6-12-12 (only if REGULAR)
  - PROCAINAMIDE (20-50mg/min)
  - AMIODARONE (150 over 10min + 1mg/ min INFUSION

This RHYTHM is ? ?



THIS RHYTHM IS: POLYMORPHIC V - TACH



MAIN IDENTIFICATION CHARACTERISTIC(S): WIDE QRS COMPLEXES, MULTIPLE SHAPES AND FORMS, POSITVE AND NEGATIVE DEFLECTIONS, APPEARS TO ROTATE BETWEEN NEGATIVE AND POSITIVE (TWISTING OF POINTS)

RATE ---------- 200 - 300
RHYTHM ---------- VARIES
P-R INTERVAL ---- N/A
P: QRS RATIO ------ N/A
QRS INTERVAL ---- VARIES

-- CRITICAL ECG ALERT --

-Immediately check patient
-Notify next "higher up" in chain of command

1. **Heart rate LESS THAN 50 or GREATER THAN 150**
2. **QT INTERVAL prolonged (usually not emergent but let Dr. know)**
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6. **PVCs that are MULTIFOCAL, 2 or MORE TOGETHER, R on T, greater than 6 per minute,**
7. **V-TACH, or WIDE QRS TACHYCARDIA of unknown origin**
8. **TORSADES de POINTES**

WIDE COMPLEX TACHYCARDIA
TORSADES de POINTES

(QRS > 120 ms)

ABC s

NO PULSE	PULSE - UNSTABLE	PULSE - STABLE
GO TO V - FIB ALGORITHM !	▪ IMMEDIATE DEFIBRILLATION START IV CONSIDER SEDATION	▪ O2 / IV / EKG ▪ MAGNESIUM INFUSION 1 - 2 gm OVER 5 - 60 min.

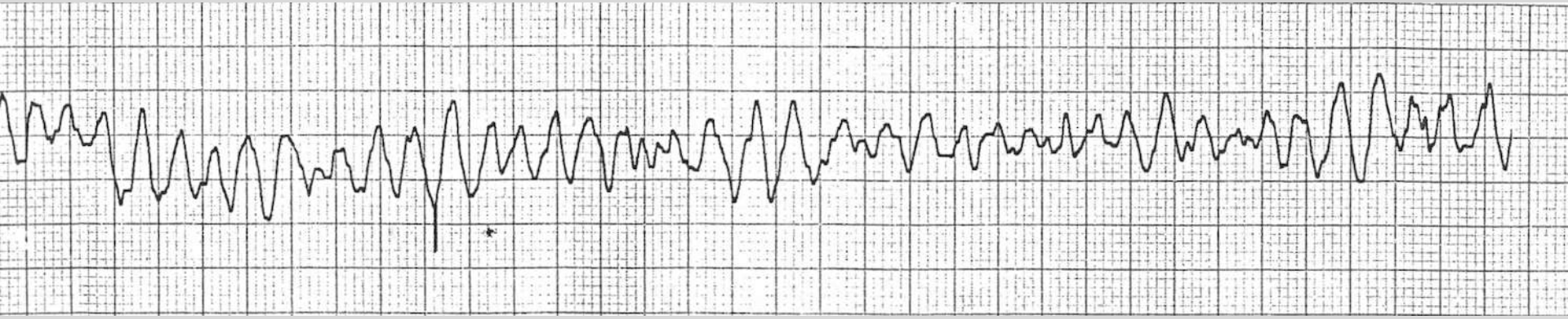
DO NOT give PROCAINAMIDE, AMIODARONE, or SOTALOL to patients with TORSADES or POLYMORPHIC VT !!!

OTHER CONSIDERATIONS:

- EVALUATE BASELINE ECG RHYTHM FOR PRONGED Q-T INVERVAL.
- EVALUATE PATIENT'S MEDS FOR Q-T PROLONGING DRUGS
  . . . if PATIENT HAS BEEN RECEIVING ANY Q-T PROLONGING DRUGS, IMMEDIATELY DISCONTINUE AND CONTACT PHYSICIAN STAT.
- EVALUATE PATIENT HISTORY FOR PREVIOUS EVENTS OF "SYNCOPE OF UNKOWN ETIOLOGY"
- EVALUATE PATIENT FOR FAMILY HISTORY FOR SUDDEN CARDIAC DEATH

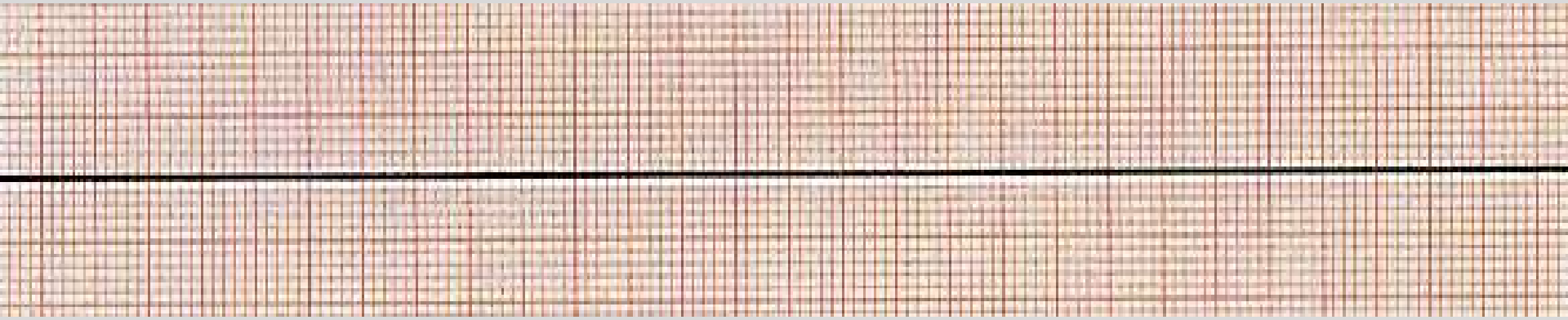
REPORT ANY ABNORMAL FINDINGS TO PHYSICIAN.

VENTRICULAR FIBRILLATION



CARDIAC ARREST RHYTHM

Ventricular Asystole



CARDIAC ARREST RHYTHM

-- CRITICAL ECG ALERT --

-Immediately check patient
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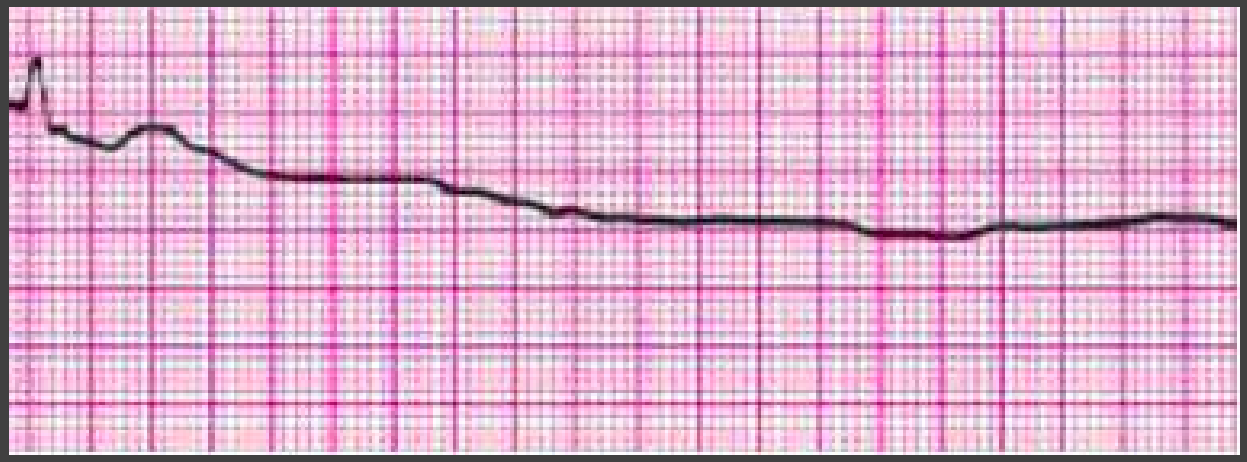
7. **V-TACH, or WIDE QRS TACHYCARDIA of unknown origin**
8. **TORSADES de POINTES**
9. **VENTRICULAR FIBRILLATION or ASYSTOLE**

If QRS complexes have a PULSE then apply



PACEMAKER ! !

CPR
|
IV / AIRWAY
|
EPI 1 mg
|

THE " H's " and the " T's "

- HYPOVOLEMIA
- HYPOXIA
- HYDROGEN ION (Ph)
- HYPOGLYCEMIA
- HYPOTHERMIA

- TOXINS
- TAMPONADE (CARDIAC)
- TENSION PNEUMOTHORAX
- THROMBOSIS (CORONARY or PULMONARY)
- TRAUMA

-- CRITICAL ECG ALERT --

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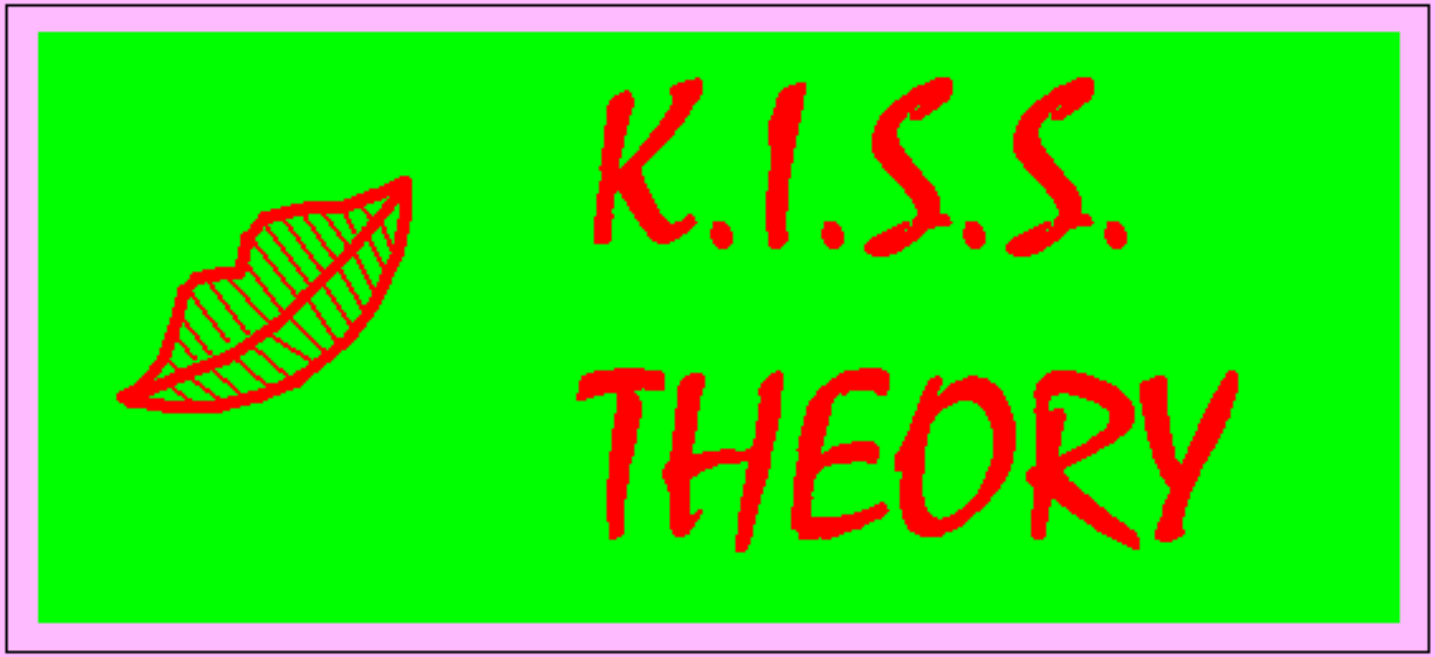
10. **PACER SPIKES WITHOUT QRS – "FAILURE TO CAPTURE"**

THE QRS COMPLEX

DIAGNOSING
BUNDLE BRANCH BLOCK



THE QRS COMPLEX

DIAGNOSING BUNDLE BRANCH BLOCK

- There are several methods to differentiate Right Bundle Branch Block (RBBB) from Left Bundle Branch Block (LBBB).

- Our methods use Lead V1 (or MCL 1)

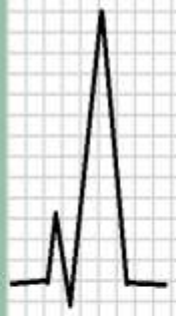
METHOD 1: Rotate rhythm strip 90 degrees clockwise ("York Hospital" Method)

METHOD 2: Terminal Deflection of QRS Complex: Negative or Positive ?

Simple “Turn Signal Method”

THE "TURN SIGNAL METHOD" for identifying BUNDLE BRANCH BLOCK

V1



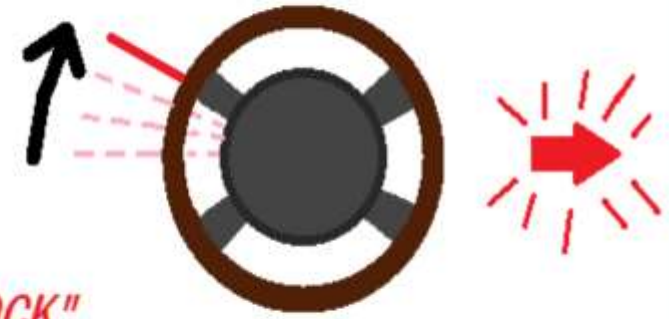
USE LEAD V1 for this technique

To make a **RIGHT TURN**

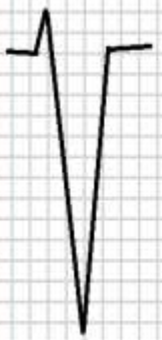
you push the turn signal lever **UP**.....

THINK:

"QRS points UP = RIGHT BUNDLE BRANCH BLOCK"



V1

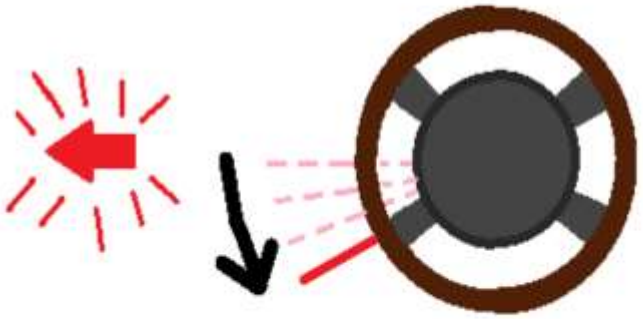


To make a **LEFT TURN**

you push the turn signal lever **DOWN** ....

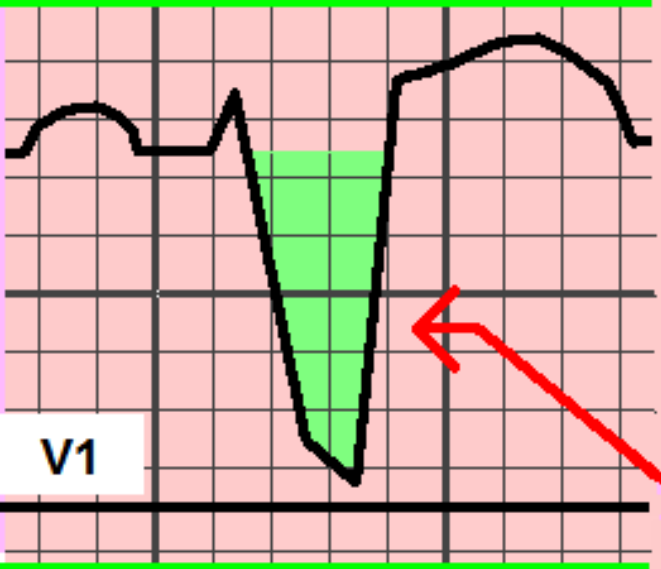
THINK:

"QRS points DOWN = LEFT BUNDLE BRANCH BLOCK"

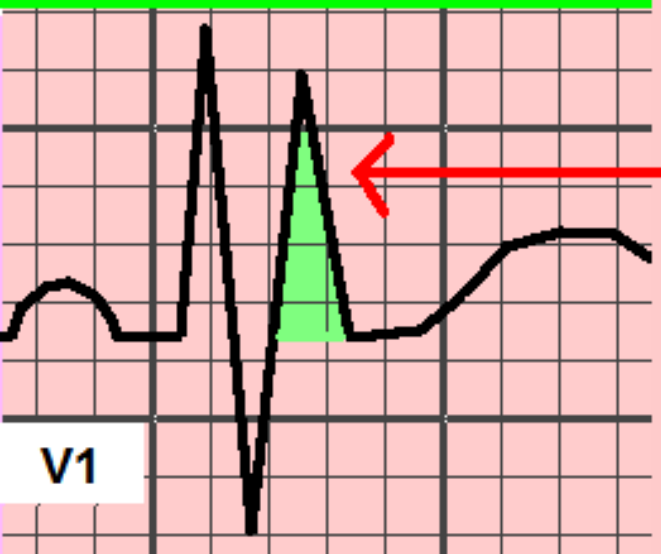


DIAGNOSING BUNDLE BRANCH BLOCK

L.B.B.B.



R.B.B.B.



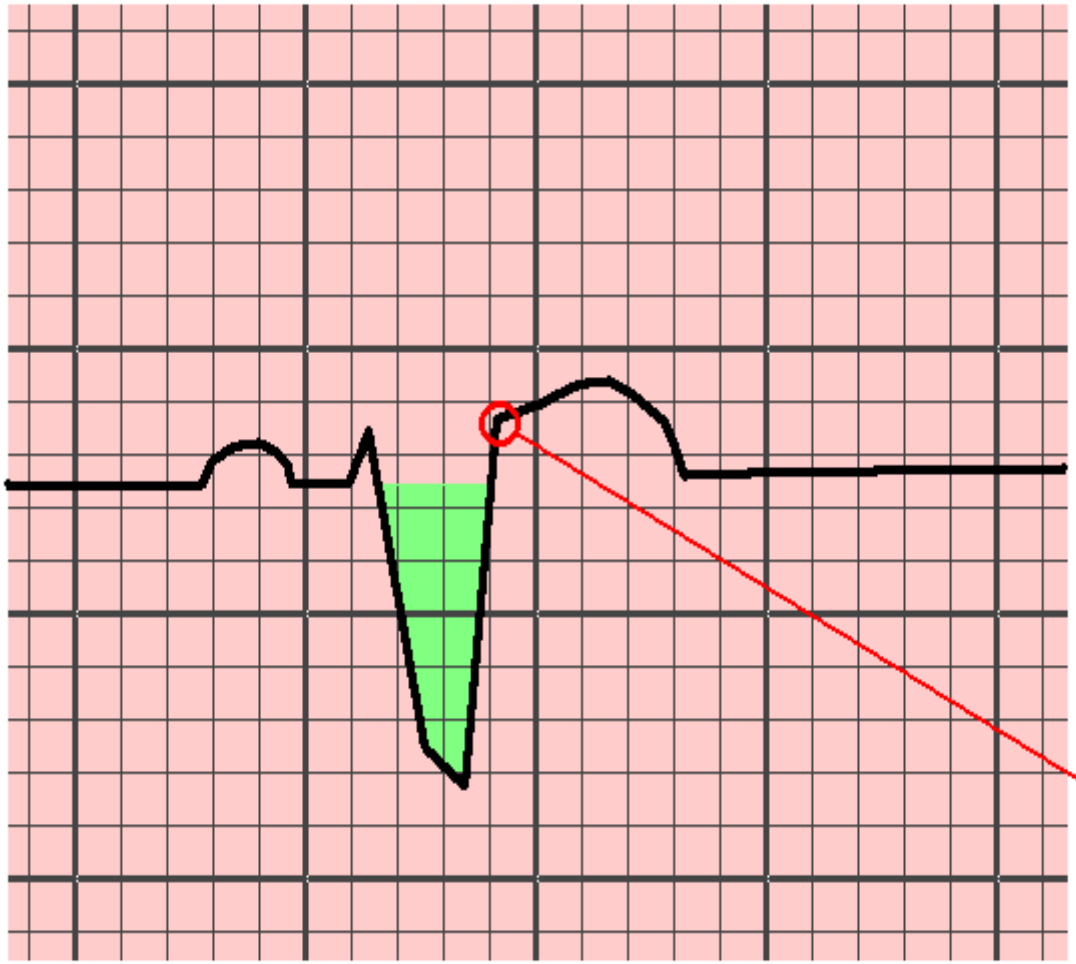
USING LEAD V1

- QRS WIDER THAN 120 ms
- BEAT IS SUPRAVENTRICULAR IN ORIGIN
- TERMINAL PHASE OF QRS COMPLEX (LAST DEFLECTION)

NEGATIVE = LEFT BUNDLE BRANCH BLOCK

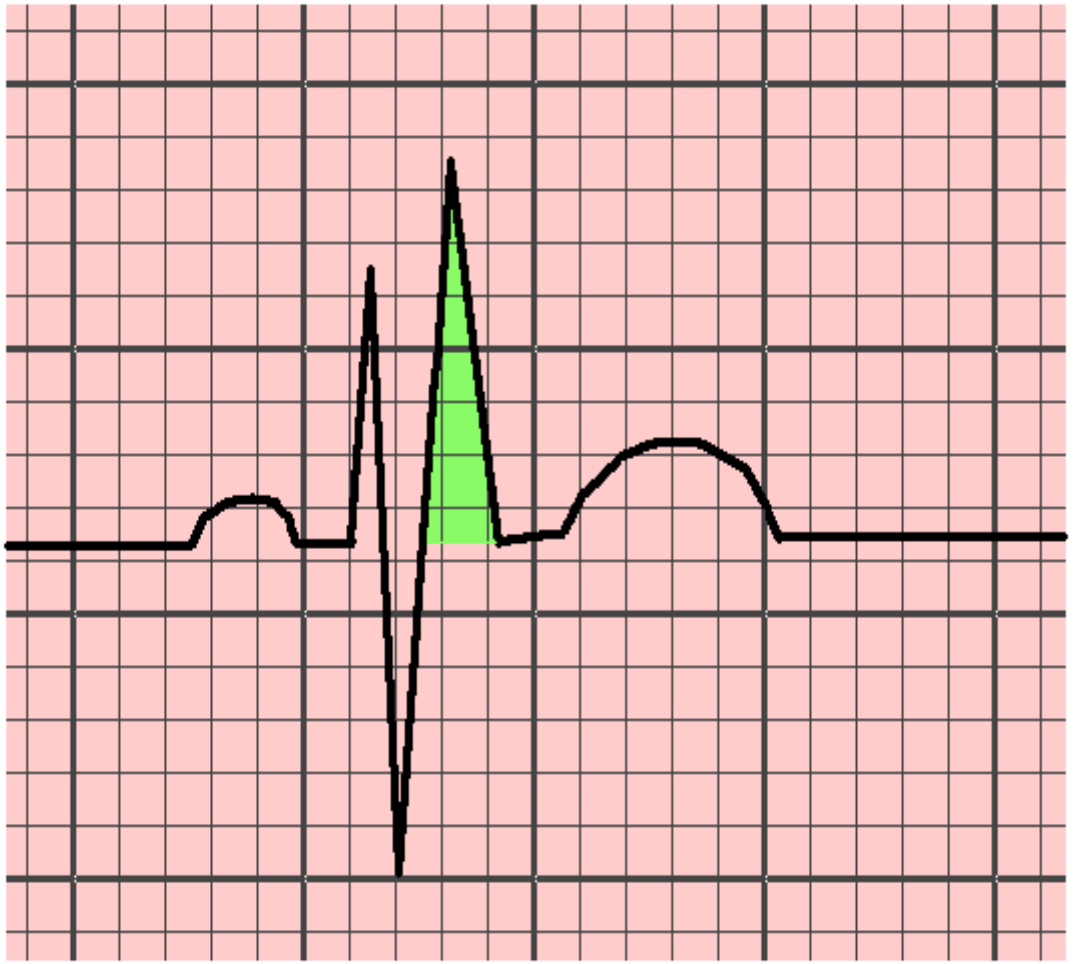
POSITIVE = RIGHT BUNDLE BRANCH BLOCK

DIAGNOSING LBBB IN LEAD V1:



- QRS GREATER THAN 120 ms (.12)
- EVIDENCE THAT THIS IS NOT VENTRICULAR BEAT
- TERMINAL PHASE (LAST PART) OF QRS COMPLEX IS NEGATIVE DEFLECTION
- S-T SEGMENTS ARE NORMALLY ALWAYS ELEVATED !

DIAGNOSING RBBB IN LEAD V1:



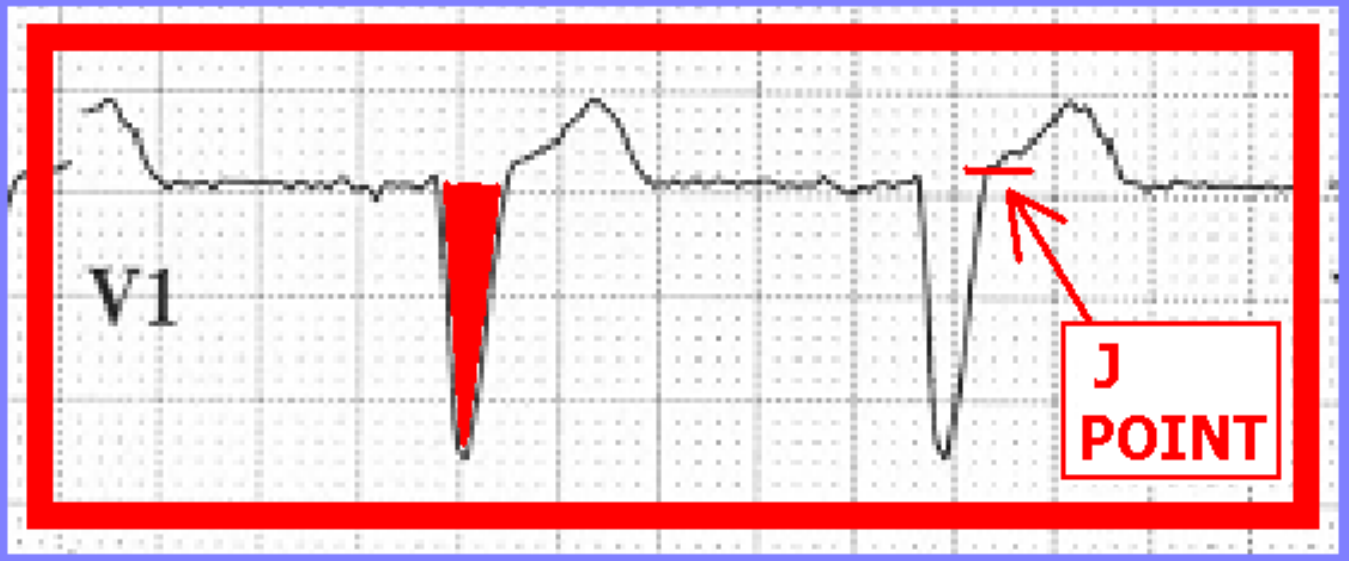
- **WIDER THAN 120 ms (.12)**

(or 3 little boxes)

- **TERMINAL PHASE (LAST PART) OF QRS COMPLEX IS POSITIVE DEFLECTION**


V1

TERMINAL PHASE OF QRS IS NEGATIVE



= LEFT BUNDLE BRANCH BLOCK


V1

TERMINAL PHASE OF QRS IS

POSITIVE

= RIGHT BUNDLE BRANCH BLOCK

-- CRITICAL ECG ALERT --

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-Notify next "higher up" in chain of command

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8. **TORSADES de POINTES**
9. **VENTRICULAR FIBRILLATION or ASYSTOLE**
10. **PACER SPIKES WITHOUT QRS – "FAILURE TO CAPTURE"**
11. **CHANGES in the QRS width (new onset Bundle Branch Block)**

Use of
TELEMETRY MONITORING
For
ONGOING EVALUATION of:

- ***Acute Coronary Syndrome***
- "Low Probability Chest Pain"
- Post PCI / STENT

Acute Coronary Syndrome (**ACS**) **includes:**

- **STEMI** (ST segment elev. MI)
- **NSTEMI** (Non-ST seg. Elev. MI)
- **Unstable Angina**

Stay tuned for
The NEXT
LEVEL of ECG
Monitoring . . .
Coming Soon!

The ECG Markers of ACS involve the:

- J Point
- ST Segment
- T Wave

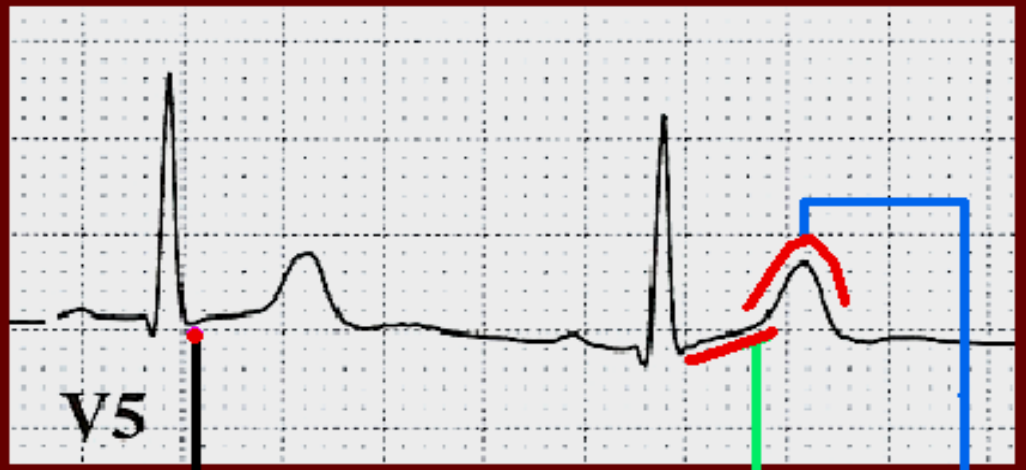
Of every lead on the 12 Lead ECG.

THE ECG should NOT CHANGE. Any changes that occur to the Patient's ECG waveforms should be considered ***ABNORMAL*** and should be ***REPORTED.***

When QRS complex width is NORMAL (< 120 ms):

NORMAL ST - T WAVES

- WHEN QRS WIDTH IS NORMAL (< 120 ms)

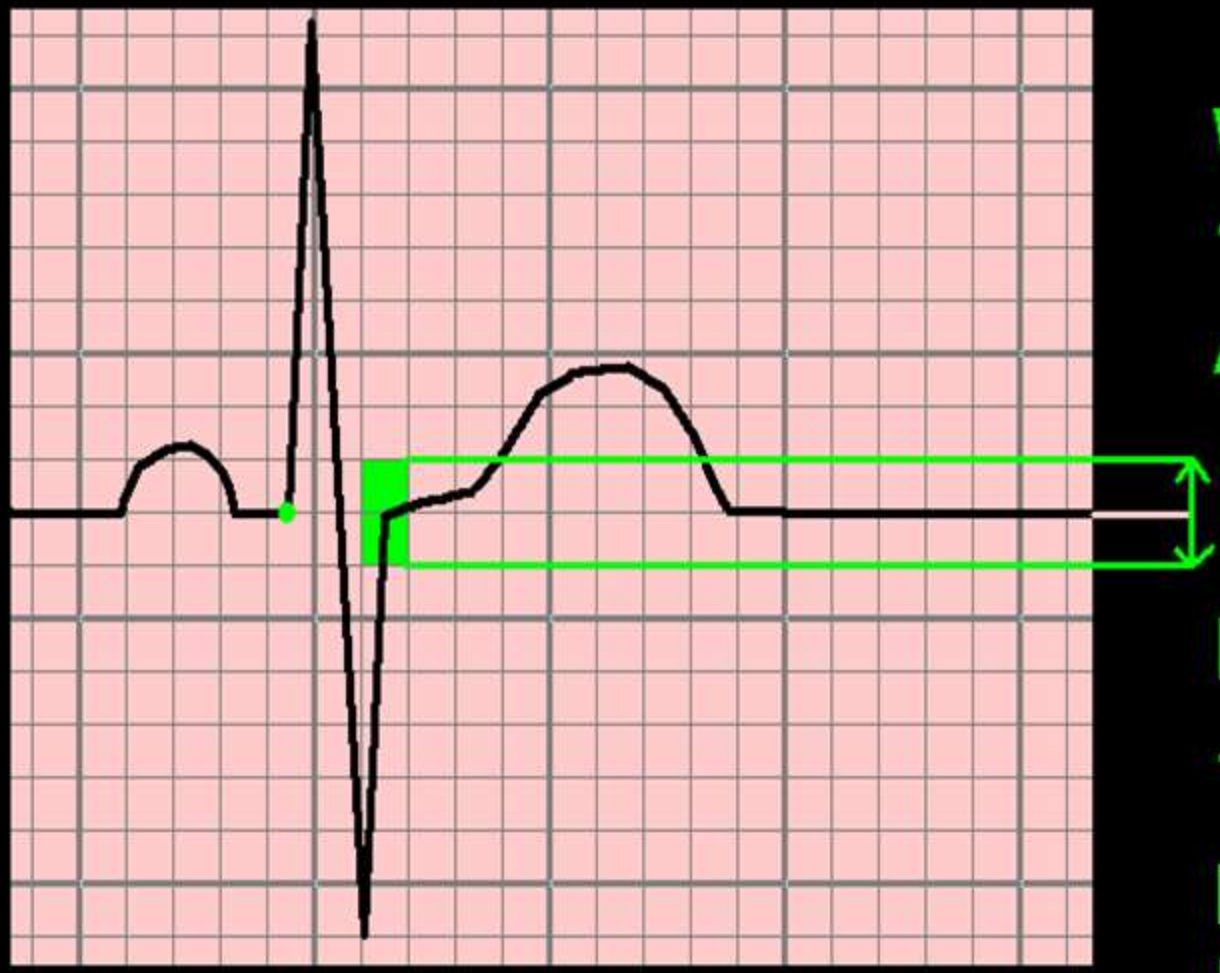


ASSESS:

- J POINT: ISOELECTRIC (or < 1 mm dev.)
- ST SEG: SLIGHT, POSITIVE INCLINATION
- T WAVE: UPRIGHT, POSITIVE

☞ *in EVERY LEAD EXCEPT aVR ! !*

THE J POINT SHOULD BE . .



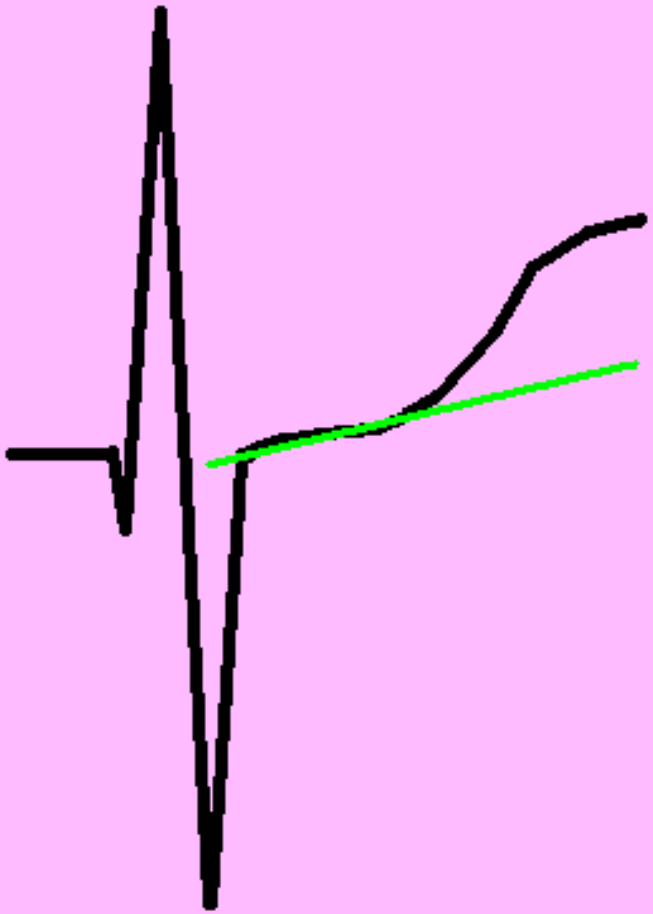
WITHIN
1 mm
ABOVE

OR

BELOW
the
ISOELECTRIC
LINE

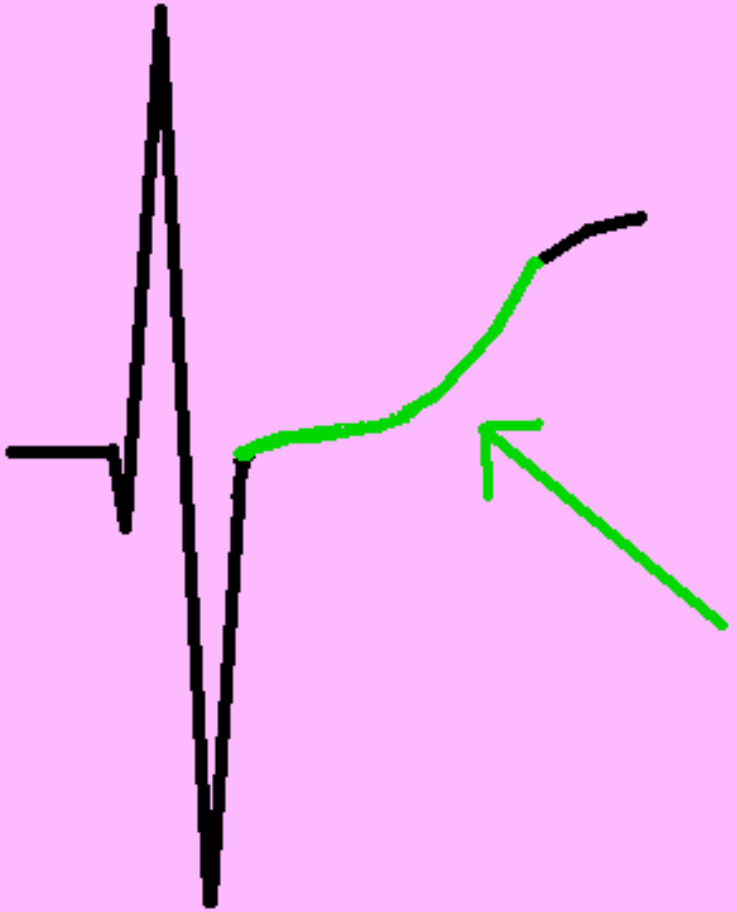
or the P-Q JUNCTION.

THE S-T SEGMENT



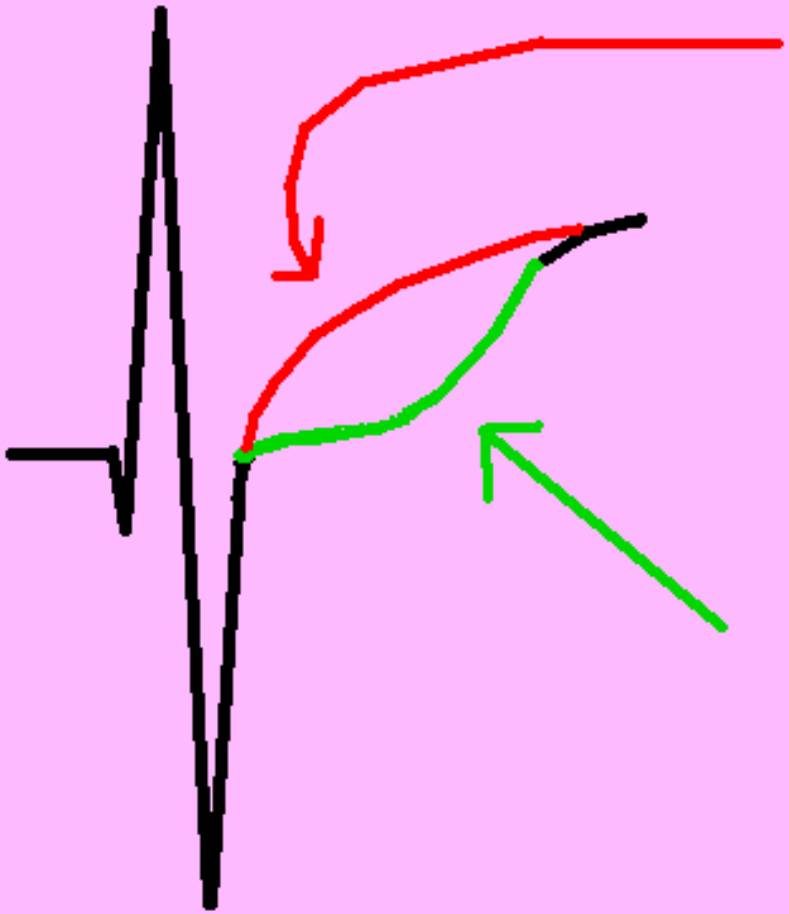
SHOULD HAVE
A "SLIGHT POSITIVE"
INCLINATION

THE S-T SEGMENT



SHOULD BE "CONCAVE" IN SHAPE . . .

THE S-T SEGMENT



AS OPPOSED TO "CONVEX" IN SHAPE

SHOULD BE "CONCAVE" IN SHAPE . . .

56 yr
Male Caucasian

Room:A9
Loc:3 Option:23

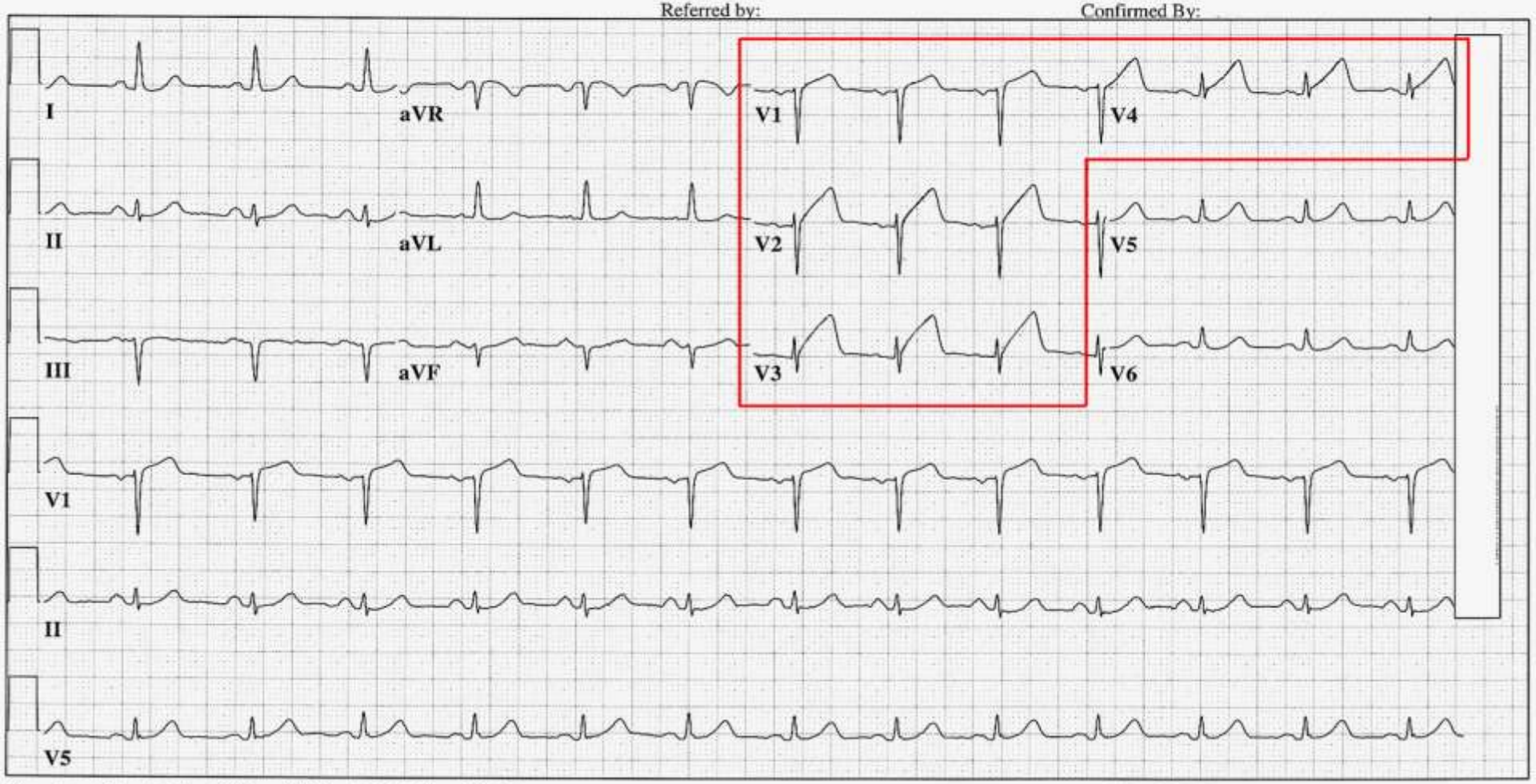
Vent. rate	80	BPM
PR interval	154	ms
QRS duration	78	ms
QT/QTc	380/438	ms
P–R–T axes	51 –24	38

**UNEDITED COPY – REPORT IS COMPUTER GENERATED ONLY, WITHOUT PHYSICIAN INTERPRETATION

Normal sinus rhythm
Normal ECG
No previous ECGs available

Technician: W Ruppert

Referred by: Confirmed By:

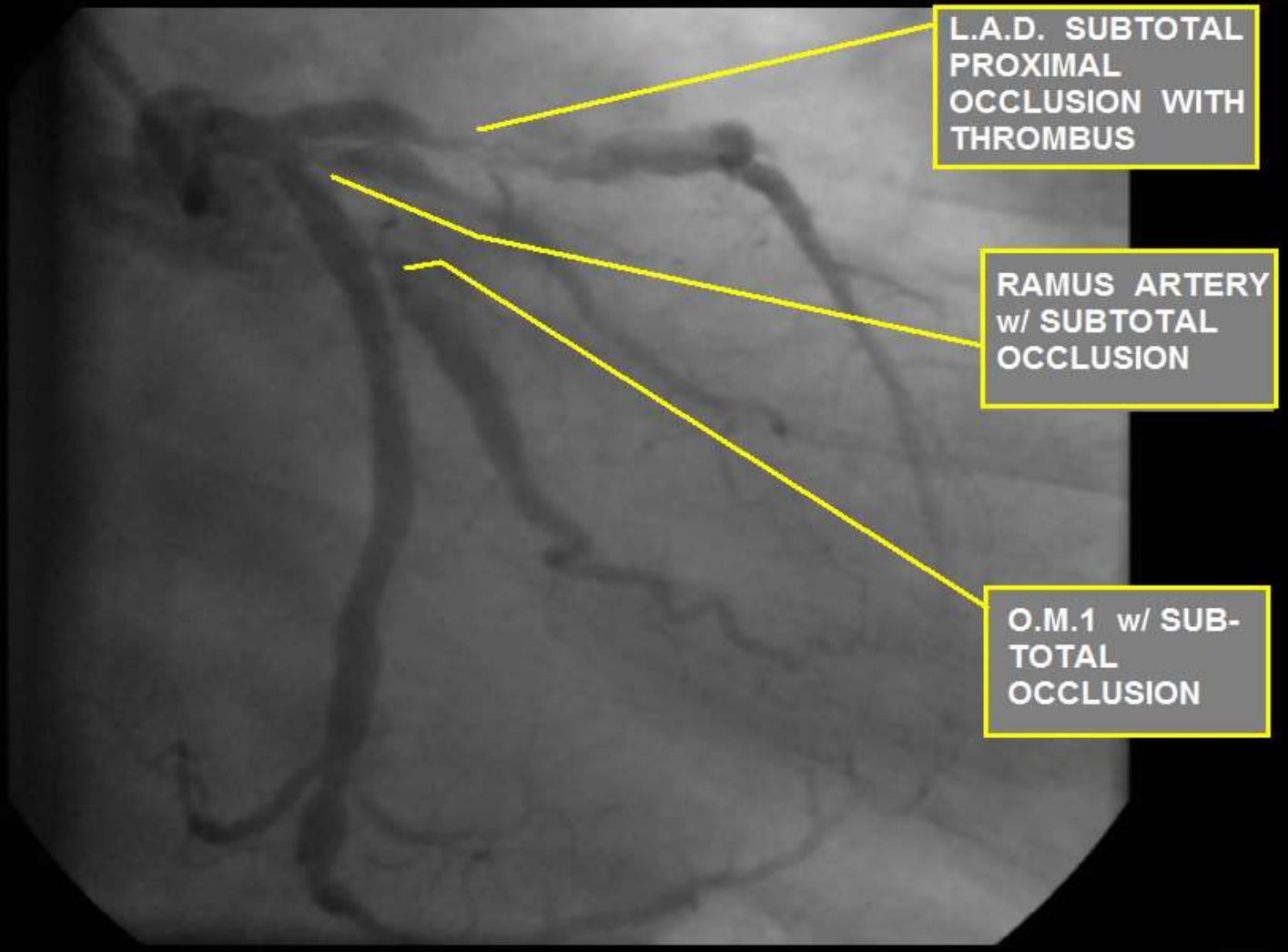


25mm/s 10mm/mV 40Hz 005C 12SL 235 CID: 3

EID:10 EDT:

ECG COMPUTER DOES NOT NOTICE THE CONVEX J-T APEX SEGMENTS !

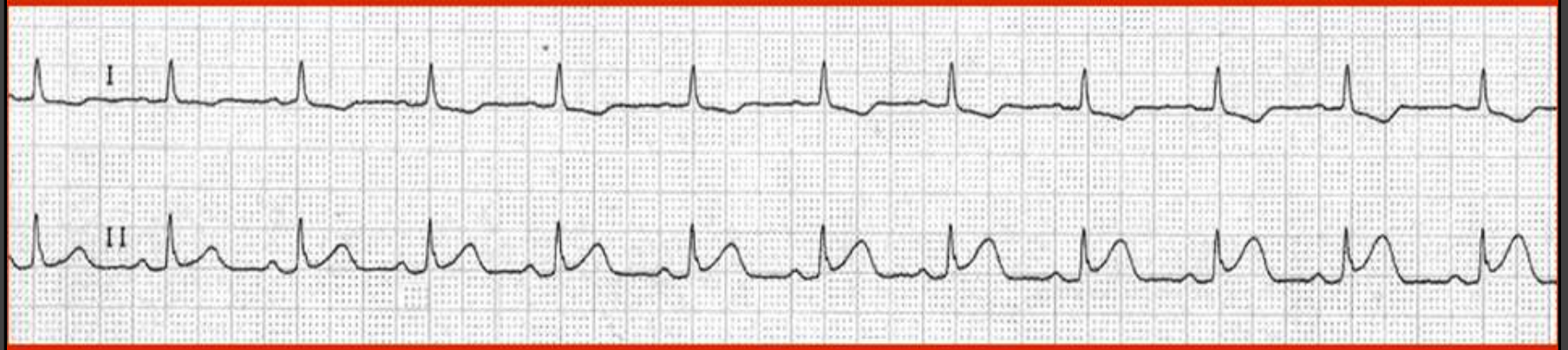
CASE STUDY: 56 y/o male with INTERMITTENT "CHEST HEAVINESS" . . . .



TREATMENT PLAN : EMERGENCY CORONARY ARTERY BYPASS SURGERY (4 VESSEL)

ST SEGMENT ELEVATION:

S-T SEGMENTS ELEVATE WITHIN SECONDS OF CORONARY ARTERY OCCLUSION:



IN THIS CASE, a normal response to balloon occlusion of the RIGHT CORONARY ARTERY during PTCA in the CARDIAC CATH LAB

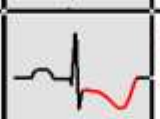
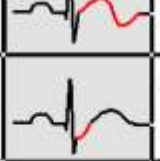
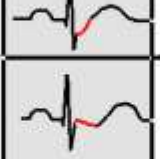
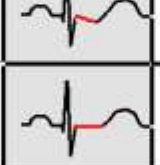
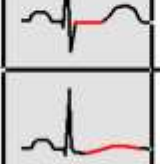
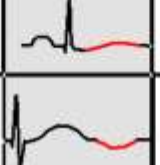
DOWNSLOPING S-T SEGMENT

FLAT S-T SEGMENT

UPSLOPING S-T SEGMENT

EKG PATTERNS of ACS & ISCHEMIA

-- J POINT, ST SEGMENT, and T WAVE ABNORMALITIES --

!	S-T SEGMENT ELEVATION at J POINT		- ACUTE MI - ACUTE PERICARDITIS / MYOCARDITIS - EARLY REPOLARIZATION
!	FLAT or CONVEX J-T APEX SEGMENT		- ACUTE MI - ISCHEMIA
!	HYPER-ACUTE T WAVE		- HYPERKALEMIA - TRANSMURAL ISCHEMIA - ACUTE MI - HYPERTROPHY
!	DEPRESSED J pt. DOWNSLOPING ST and INVERTED T		- ACUTE (NON-Q WAVE) MI - ACUTE MI - (RECIPROCAL CHANGES) - ISCHEMIA
	INVERTED T WAVE		- MYOCARDITIS - ELECTROLYTE IMBAL. - ISCHEMIA
	SHARP S-T T ANGLE		- ACUTE MI (NOT COMMON) - ISCHEMIA
	BI-PHASIC T WAVE (WELLEN'S)		- SUB-TOTAL LAD LESION - VASOSPASM - HYPERTROPHY
	DEPRESSED J POINT with UPSLOPING ST		- ISCHEMIA
	DOWNSLOPING S-T SEGMENT		- ISCHEMIA
?	FLAT S-T SEGMENT > 120 ms		- ISCHEMIA
?	LOW VOLTAGE T WAVE WITH NORMAL QRS		- ISCHEMIA
?	U WAVE POLARITY OPPOSITE THAT OF T WAVE		- ISCHEMIA

-- CRITICAL ECG ALERT --

-Immediately check patient
-Notify next "higher up" in chain of command

1. Heart rate LESS THAN 50 or GREATER THAN 150
2. QT INTERVAL prolonged (usually not emergent but let Dr. know)
3. 2nd degree type II or 3rd degree HEART BLOCK
4. SINUS ARREST with periods of ASYSTOLE
5. NEW ONSET of any DYSRHYTHMIA
6. PVCs that are MULTIFOCAL, 2 or MORE TOGETHER, R on T, greater than 6 per minute,
7. V-TACH, or WIDE QRS TACHYCARDIA of unknown origin
8. TORSADES de POINTES
9. VENTRICULAR FIBRILLATION or ASYSTOLE
10. PACER SPIKES WITHOUT QRS – "FAILURE TO CAPTURE"
11. CHANGES in the QRS width (new onset Bundle Branch Block)
12. CHANGES to J Point, ST Segment, and/or T Waves

WHAT IS YOUR INTERPRETATION OF THIS RHYTHM STRIP ?

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SIGNIFICANT ST SEGMENT ELEVATION, most likely patient is suffering ***STEMI***

WHAT WOULD THE MOST APPROPRIATE COURSE OF ACTION BE ?

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<u>Immediately:</u>

notify Charge RN

check patient

obtain 12 Lead ECG

Notify physician / Cardiologist

Activate STEMI protocol

-- CRITICAL ECG ALERT --

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My top two reasons for giving everything in life the best I have to offer.