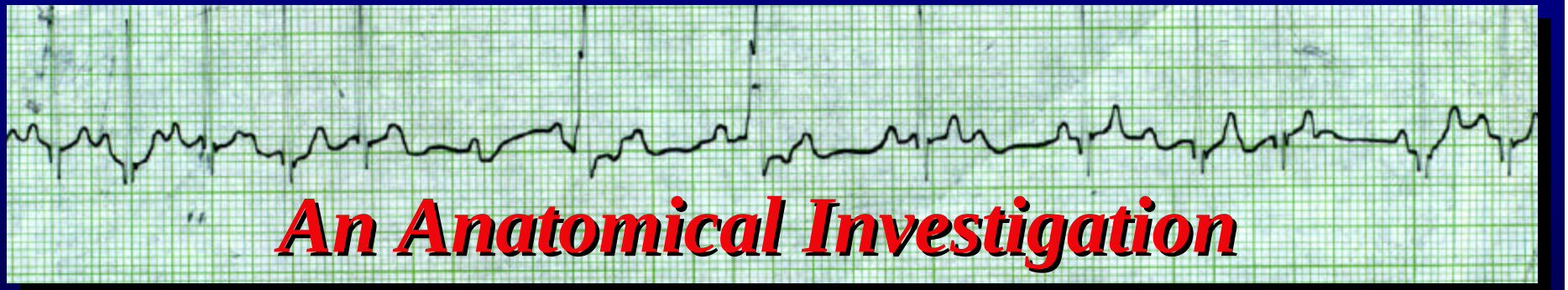
Approaching Block



An Anatomical Investigation into Atrioventricular Conduction Abnormalities

Ray Fowler, M.D., FACEP

Assistant Professor of
Emergency Medicine
The University of Texas
Southwestern

drray@
doctorfowler.com

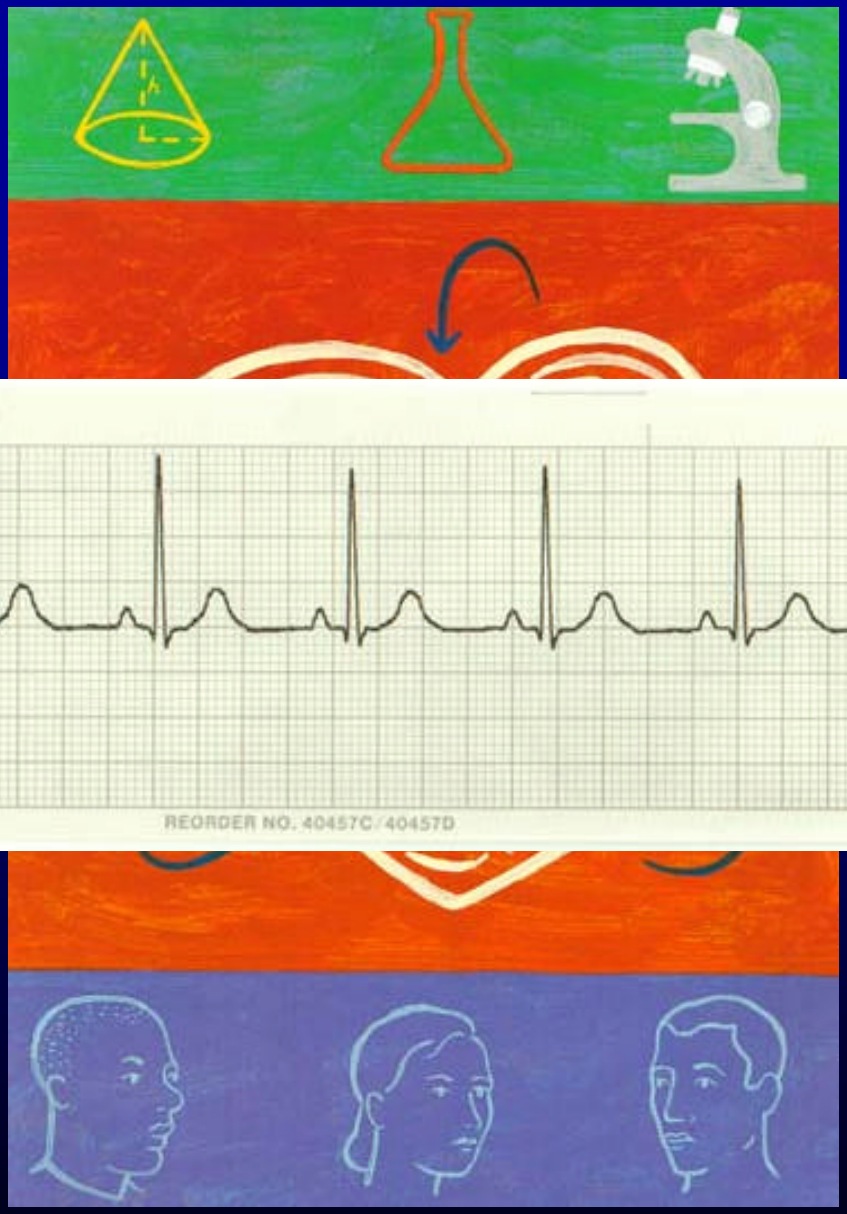
This lecture on AV Block…

. . . . is dedicated in loving memory of Nurse Gwen Bramblett

Nurse

Educator

Friend


II AG x3.50 DELAYED
HEWLETT-PACKARD
REORDER NO. 40457C/40457D

00001 02-Mar-1999 11:56:06 AM test, HQ J & J EMS SERVICES UNLIMITED

50 Years Male 145 lbs Blood Pressure: 100/80

Rate	71
PR	164
QRSD	136
QT	345
QTc	375

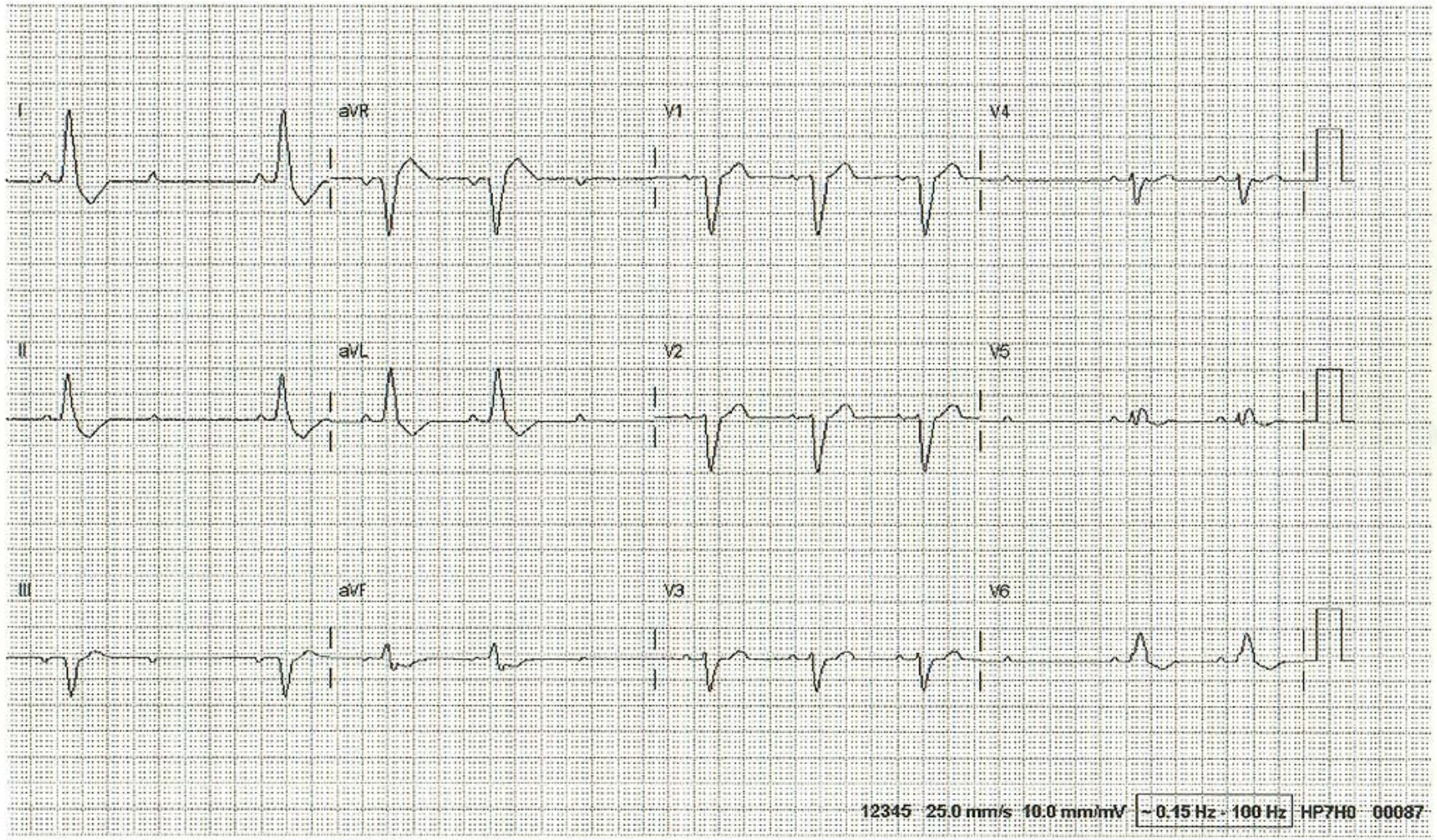
Axis	
P	-2
QRS	3
T	193

. Patient's ECG DOES NOT meet ST criteria for acute MI or ECG DOES NOT meet inclusion criteria for TPI analysis.
. ... QRS duration detected is > 130 ms
. ... LBBB Detected
. Time since acute ischemic symptom: 20 Min.; Hx: Diabetes, Hypertension

smoker
y

Requested by:

Unconfirmed diagnosis.

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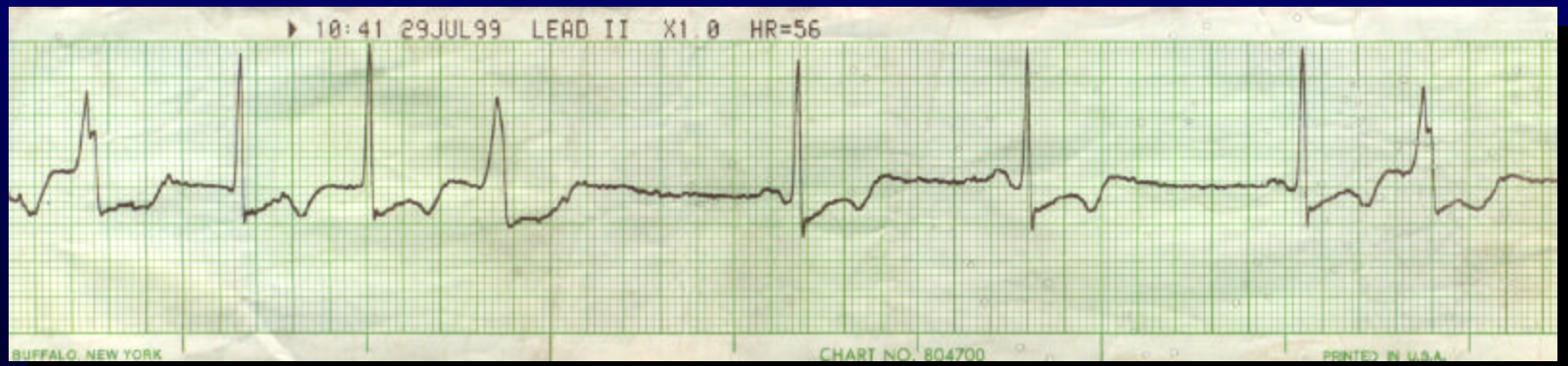
PRINTED IN U.S.A.
MEDI-TRACE
GRAPHIC CONTROLS CORPORATION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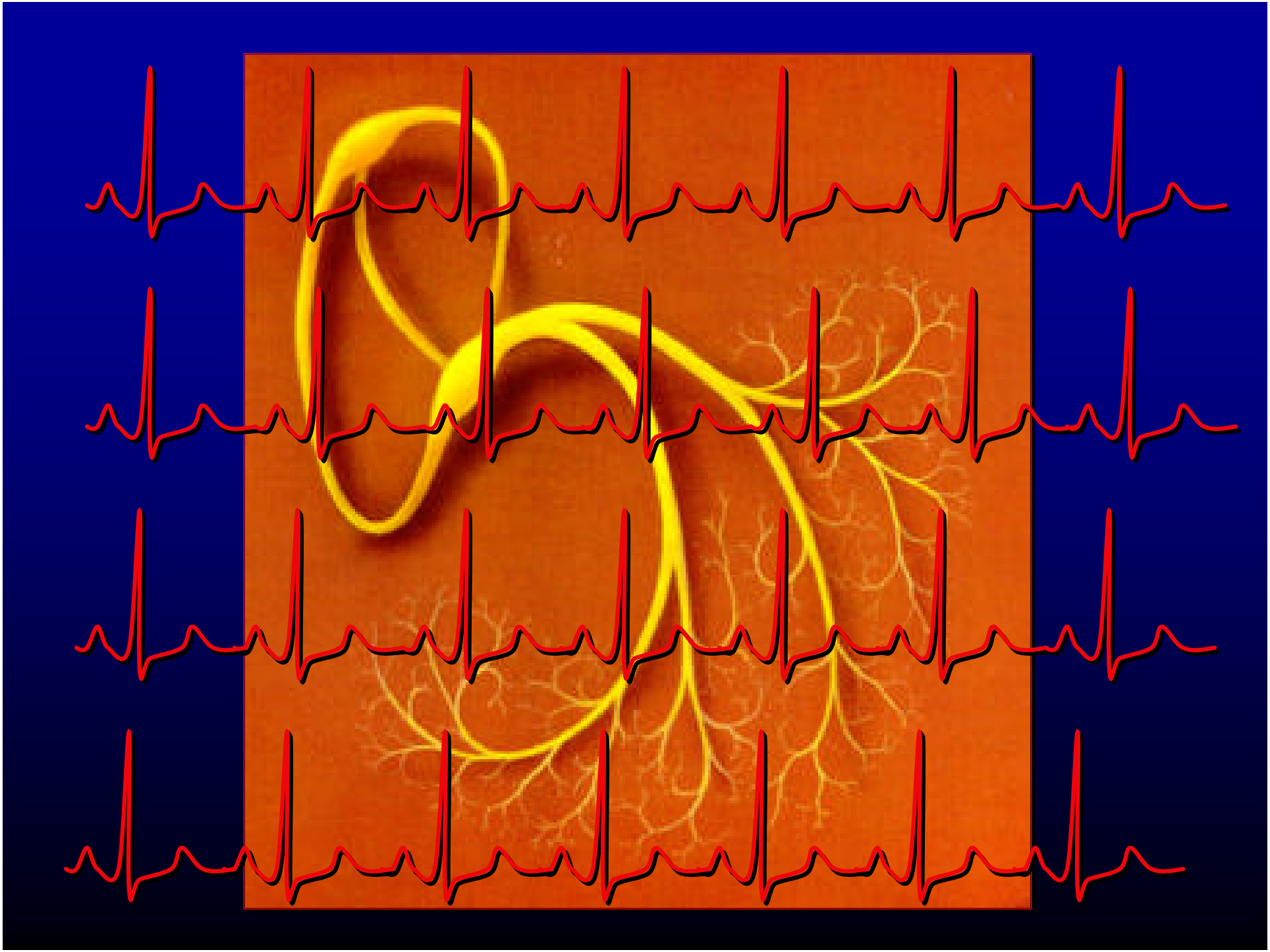
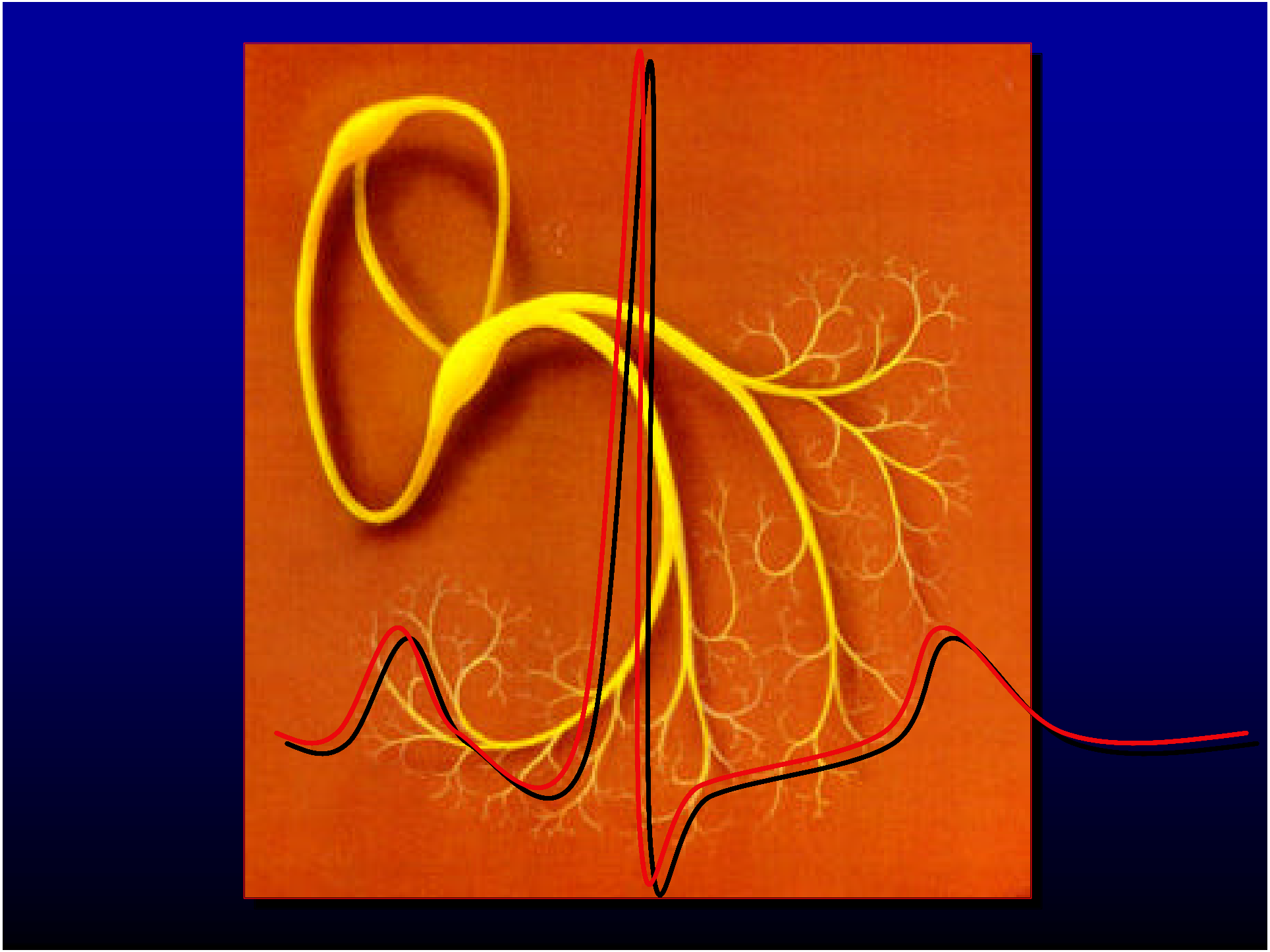
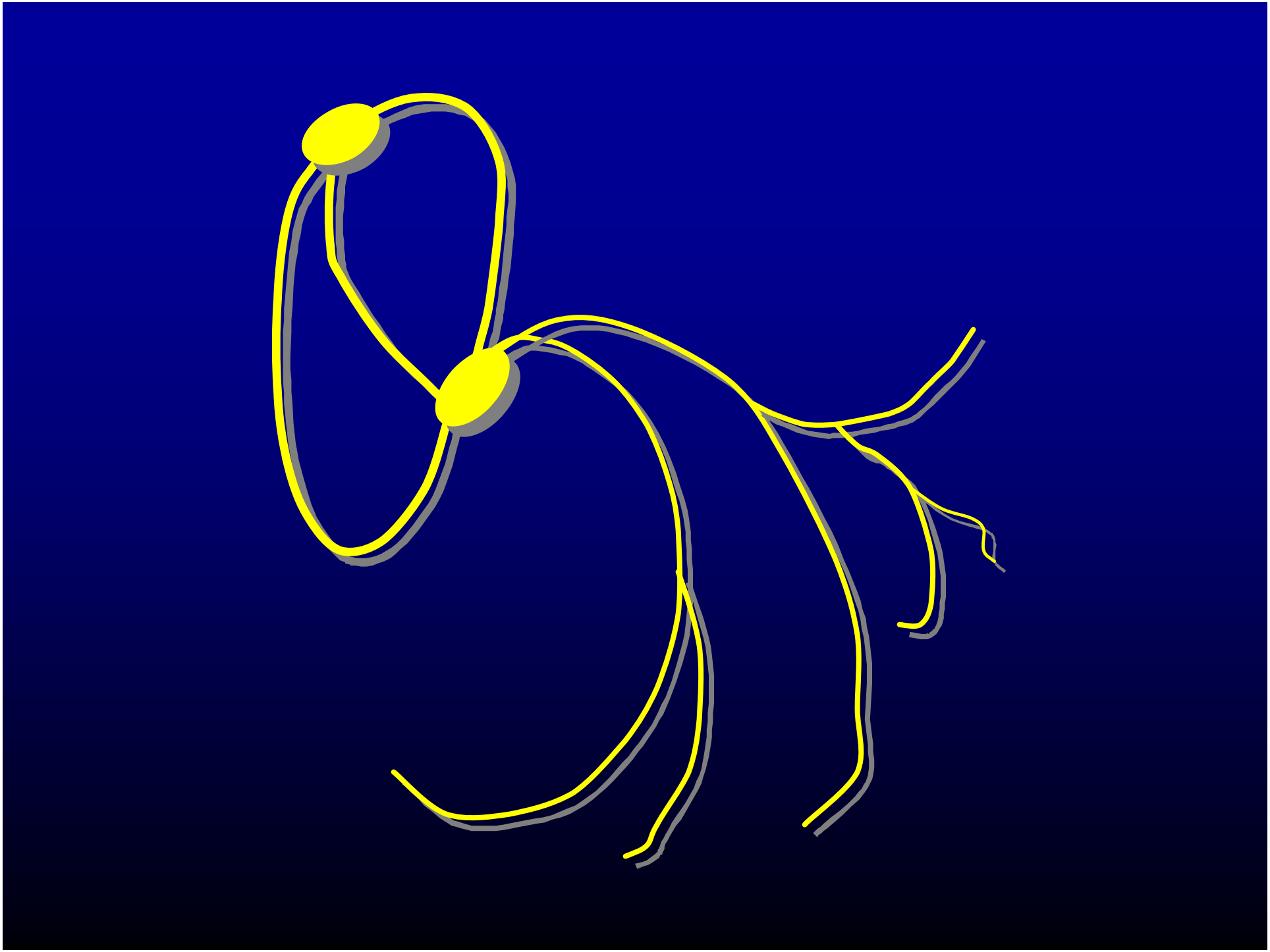






We have to interpret the anatomy backwards:

- The EKG gives us the answer
- We have to figure out what the problem is

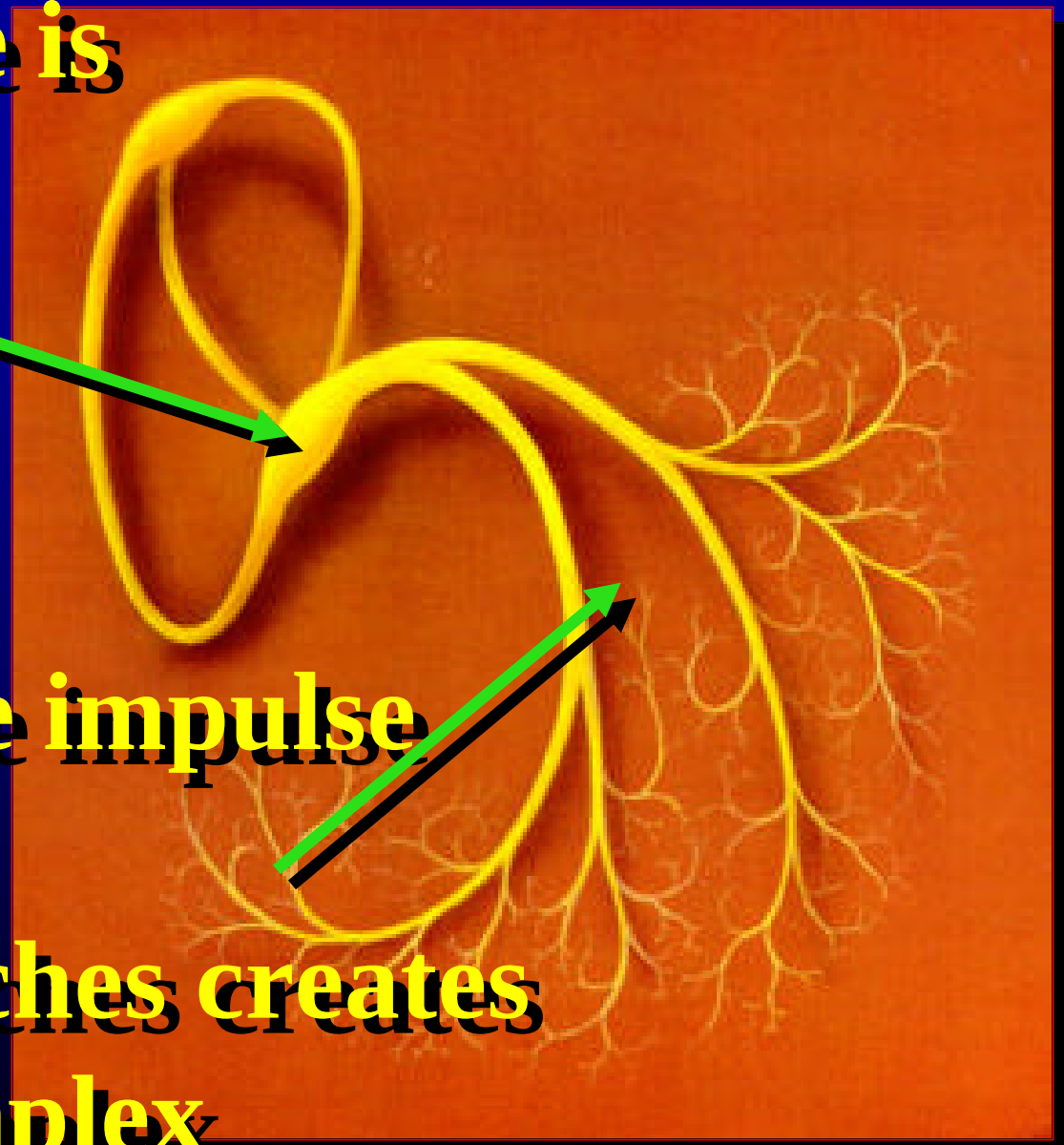
The anatomical approach to EKG analysis completely solves the problem

Always remember:

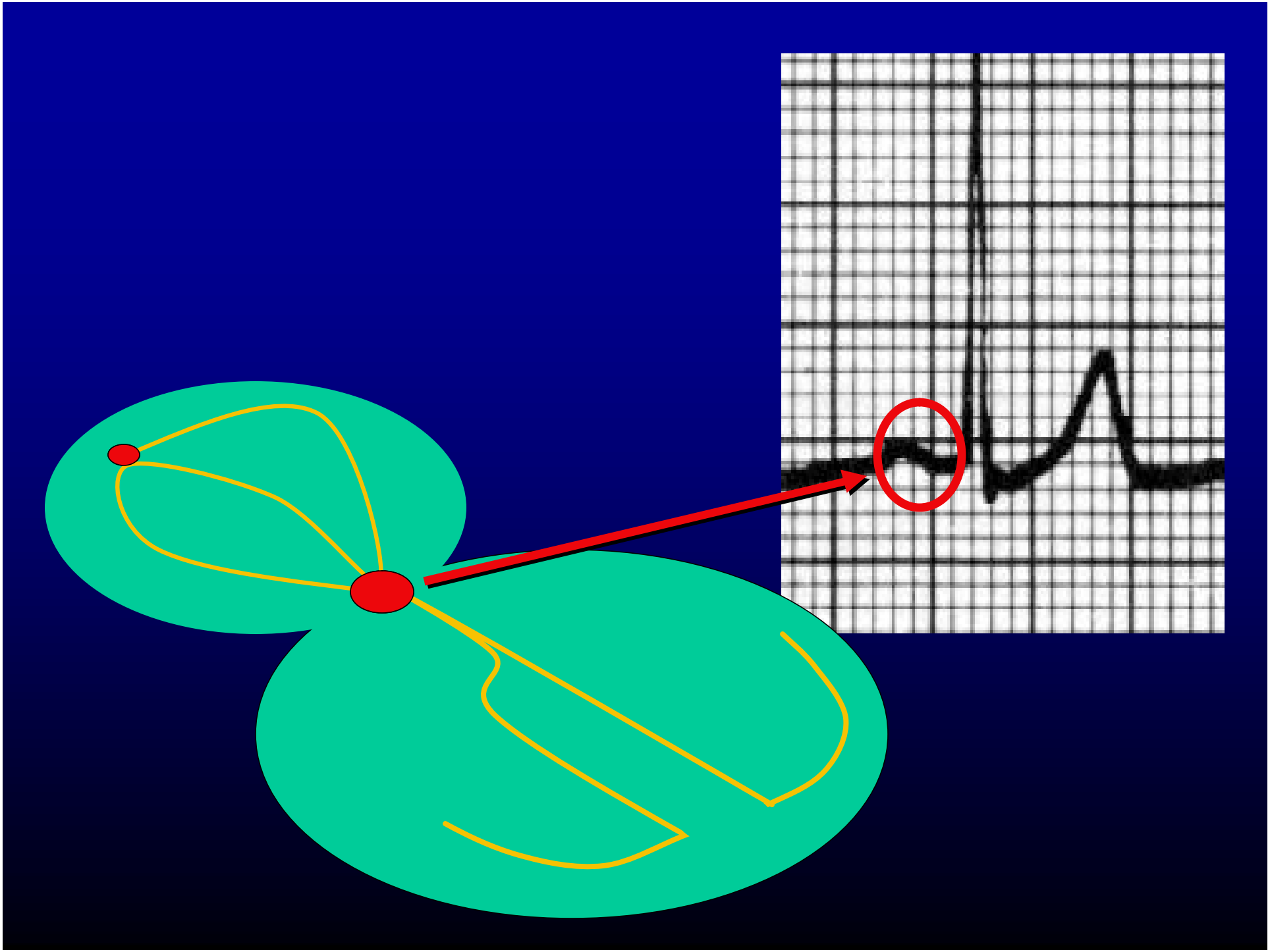
The EKG is nothing but a voltage meter's representation of the heart's anatomy

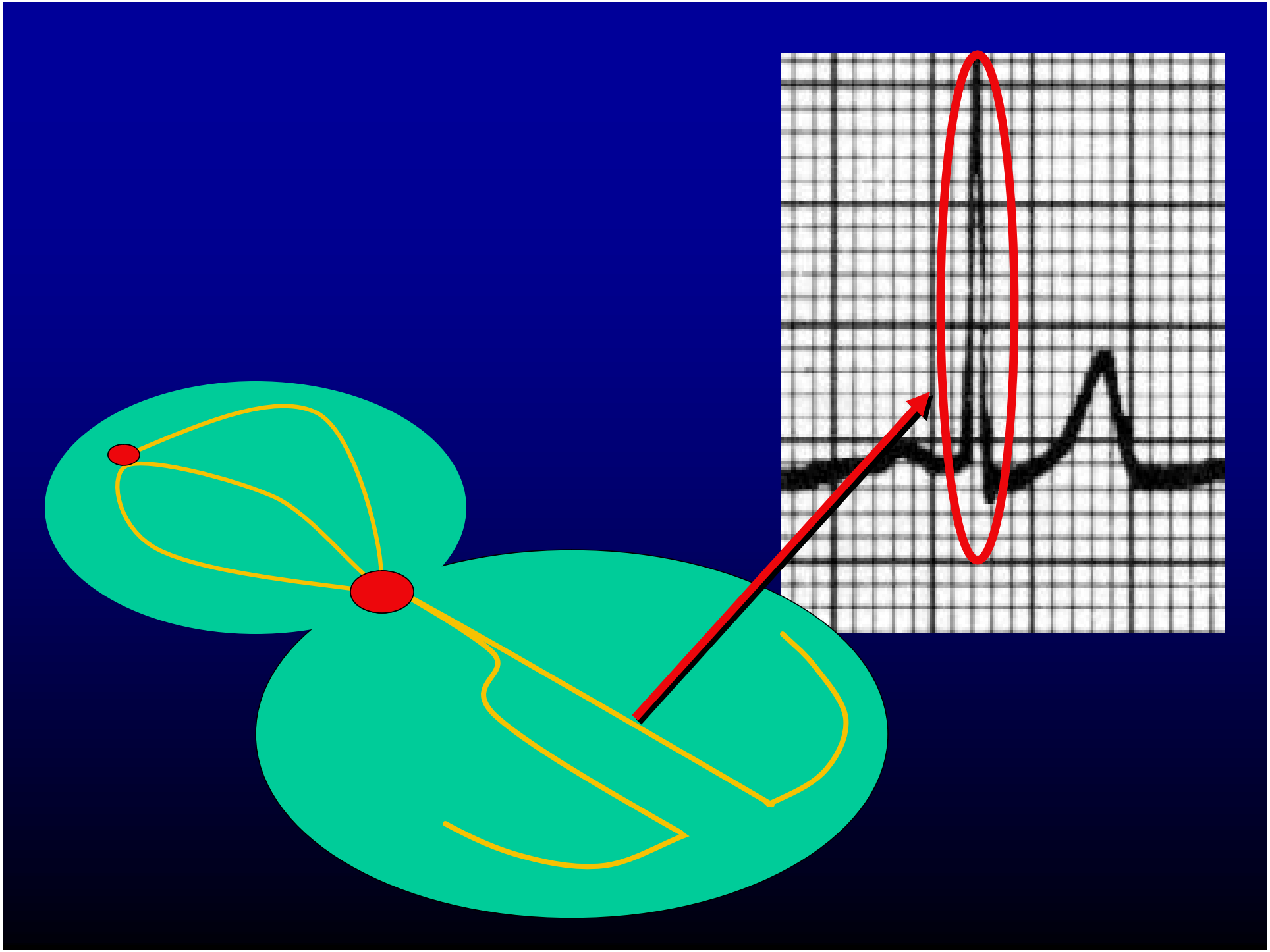
It is a primitive photograph!

The AV node is responsible for the PR interval



Spread of the impulse through the bundle branches creates the QRS complex

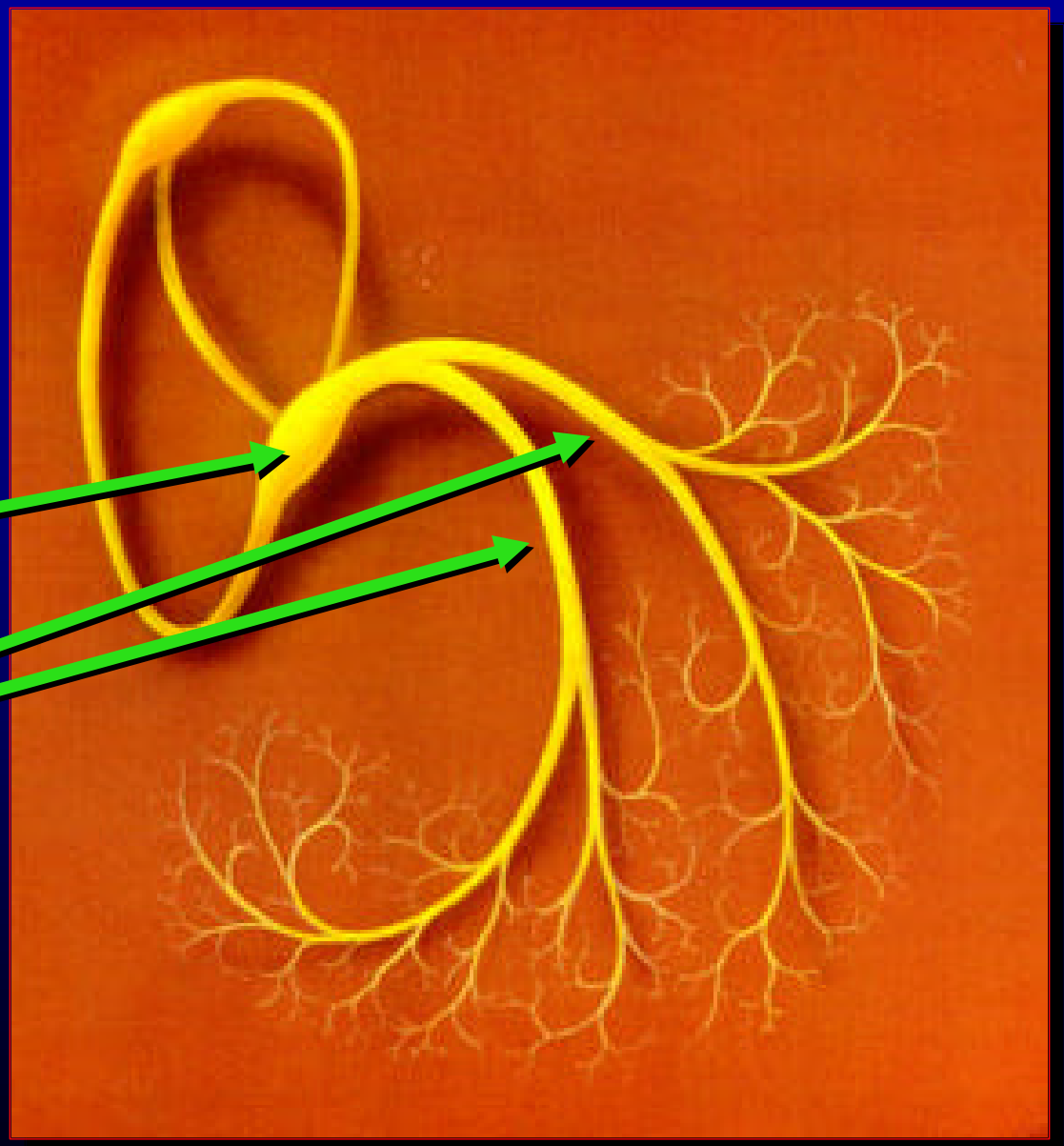




Block means
a disturbance in the conduction
between
the atria and the ventricles

Block

AV node
or
Bundles



Old Terminology meets the anatomical understanding:

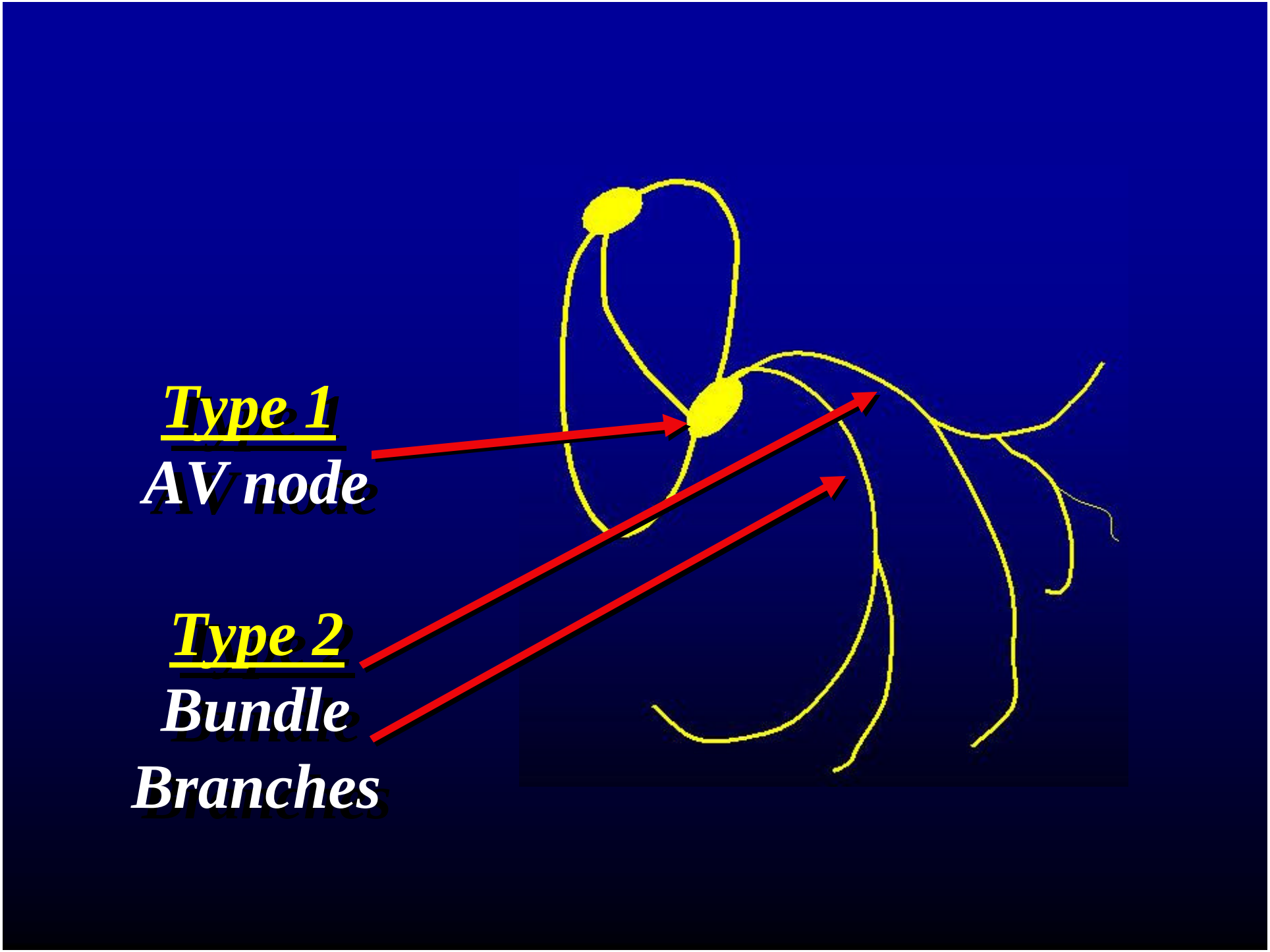
AV node problems: A sick AV node (usually due to Right Coronary problems) causes a sick PR interval:

1. **Fixed long**
2. **Varying, usually lengthening until a beat drops**

Old Terminology meets the anatomical understanding:

Bundle Branch problems: A sick bundle branch causes a sick QRS complex

1. **Widening when a certain rate is reached**
   "Rate Related Bundle Branch Block"
2. **Fixed wide with no dropped beats**
   "Bundle Branch Block"
3. **Fixed wide with dropped beats**
   "Second degree Type II"
4. **Complete heart block (VERY sick BB's)**
   "Third degree (type 2)"


Type 1
AV node
Type 2
Bundle
Branches

So, really there are two types of "block" on EKG's:

An AV node thing:

PR interval changes

Bundle branch disturbances:

QRS complex changes

The Nomenclature Confusion

Blocks can be present all the time *OR* they can come and go

The “degree names” (1st,2nd,3rd) don’t include fixed bundle branch blocks

The old terminology
didn't allow for the inclusion
of Rate Related and
Fixed Bundle Branch Blocks

It is FAR easier
just to think of the blocks
as to where they occur.

After all, THAT is what the EKG is
telling you anyway

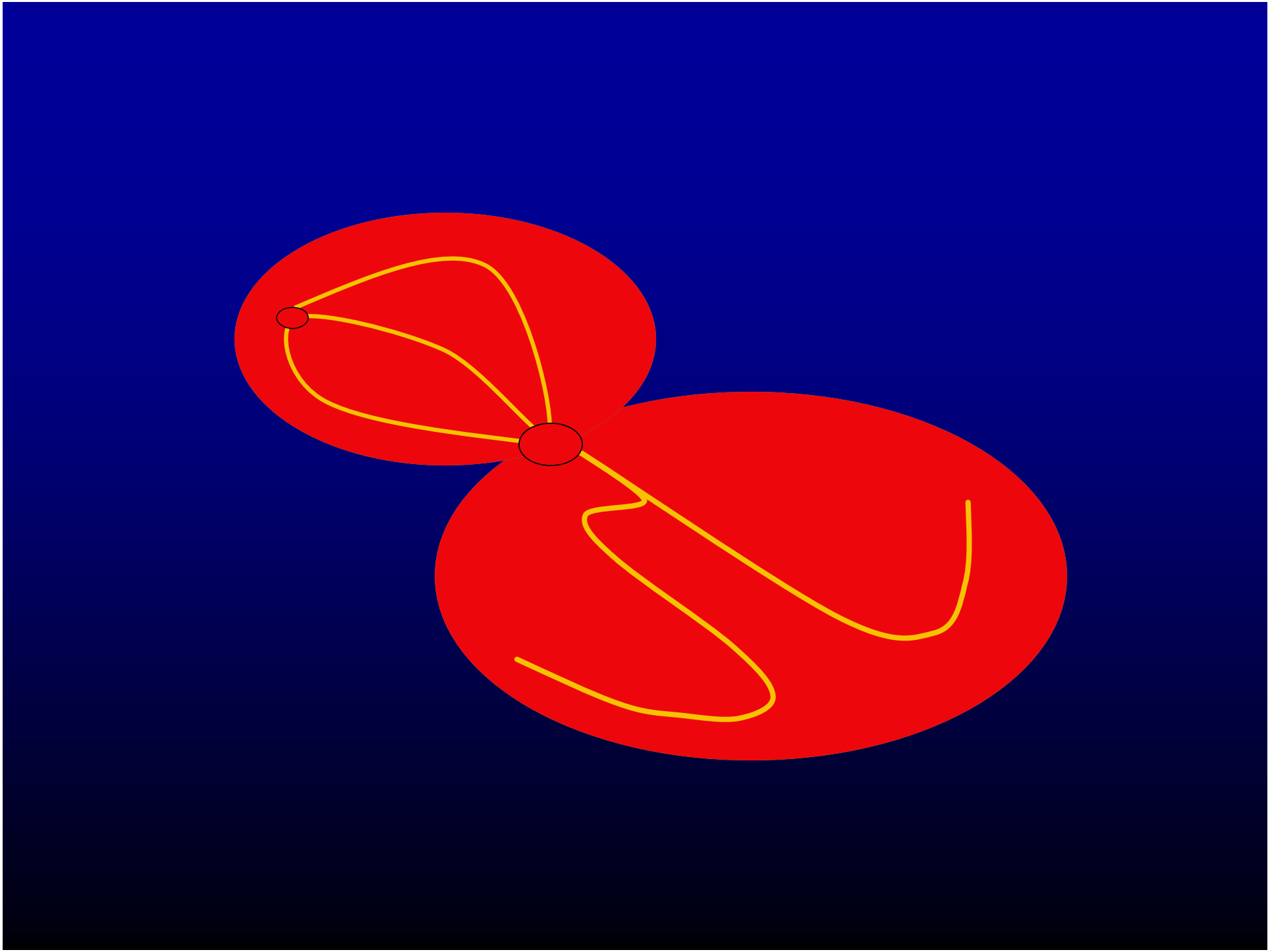
So, we all grew up thinking that "block" was some weird condition that could only be understood by cardiologists

AND

that the fixed and rate related bundle branch blocks were something else that inconveniently shared the same name

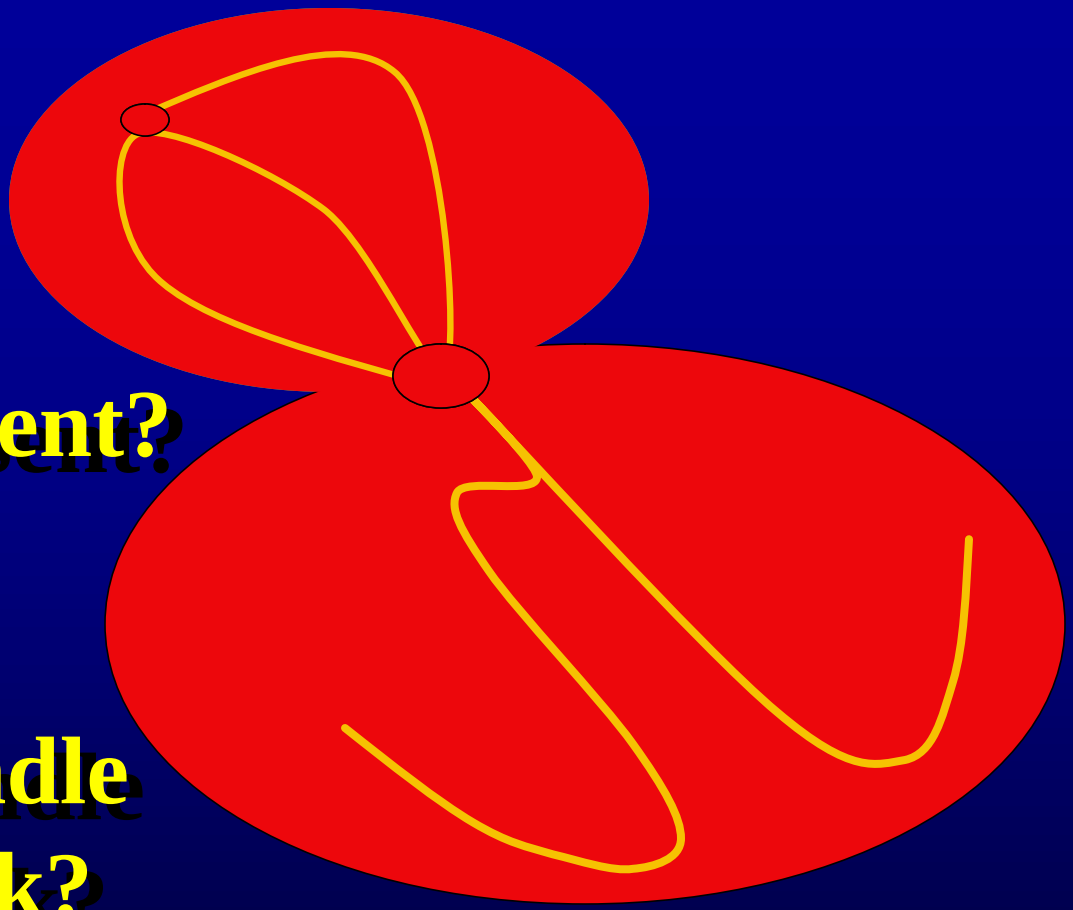
The Usual Banter

1. Rate
2. Rhythm
3. P Waves
4. PR Interval
5. QRS Complex
6. ST segment
7. T waves
8. U waves
9. Summary



What are the questions that we are supposed to ask?

1. Rate?
2. Rhythm?
3. Atrial activity present?
4. Is the AV node sick?
5. Are the bundle branches sick?
6. ST segment changes?
7. Abnormal T waves?
8. Summary…



We're ALL practical people here, so let's use a practical solution:

1. Rate
2. Rhythm
3. Atrial activity present?
4. Is the AV node sick?
5. Are the bundle branches sick?
6. ST segment changes?
7. Abnormal T waves?
8. Summary

“Block” is like “burns”

First / “All” - All the skin is Okay
All the beats get through

Second / “Some” - Some of the skin is Okay
Some of the beats get through

Third / “None” - None of the skin is Okay
None of the beats get through

Type of Block	Need for Permanent Pacemaker
AV Nodal of any sort	< 1%
Mobitz 2 and InfraHIS type 3	99%

The dilemma: We are not going to be performing EP studies in the field

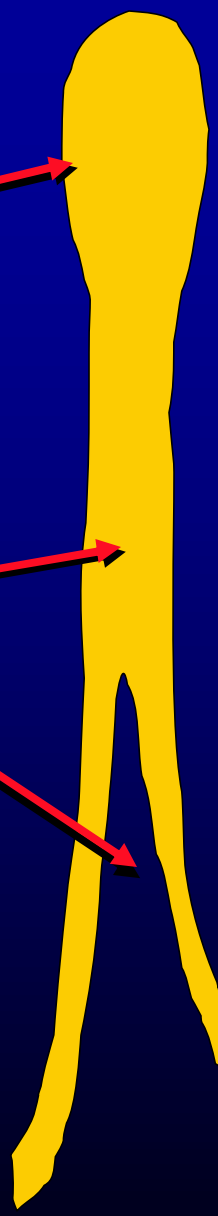
We are, after all. trying to get at the "site" of the block

Generally, if the complex is narrow, the risk is less AND the condition is almost always reversible

If the complex is wide, the condition tends to be recurrent and the results may be catastrophic

Type 1

Type 2



1st (All)	2nd (Some)	3rd (None)
Prolonged PR, Fixed or Variable	RP-PR Reciprocity (usually Prolonging PR)	Variable PR, Narrow Complex
Bundle Branch Block, Either Fixed or Rate Related	Bundle Branch Block, Normal PR	Variable PR, Usually Wide Complex, May be narrow

The Original Dogma

Normal PR = AV node

probably OK

Fixed long PR = 1st degree

AV block (Classical)

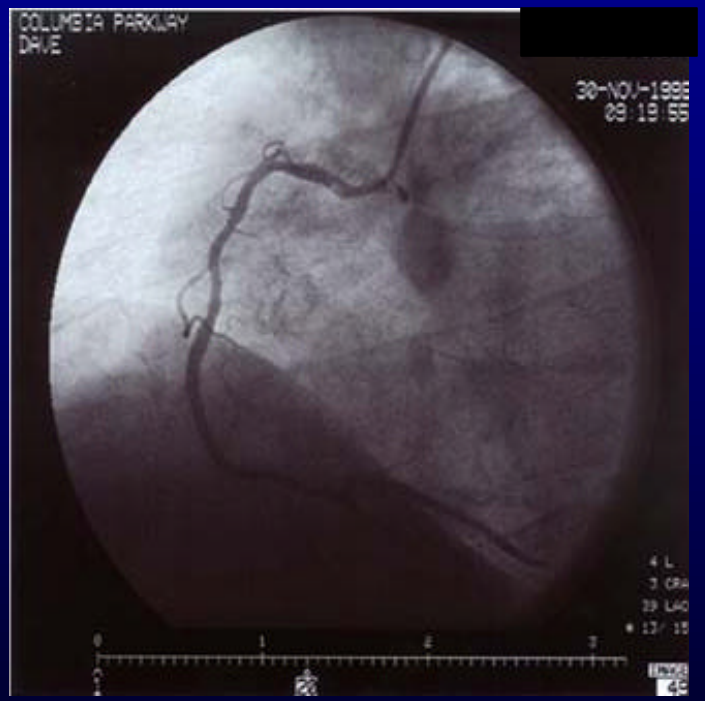
Prolonging PR = 2nd degree

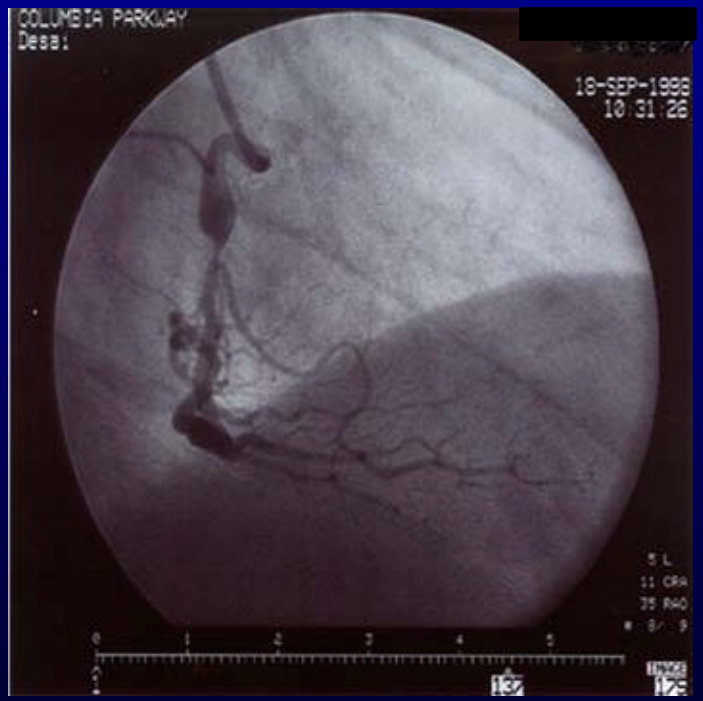
type 1, Wenckebach

Completely variable PR =

Complete block

AV Node Problems relate to the Right Coronary Artery

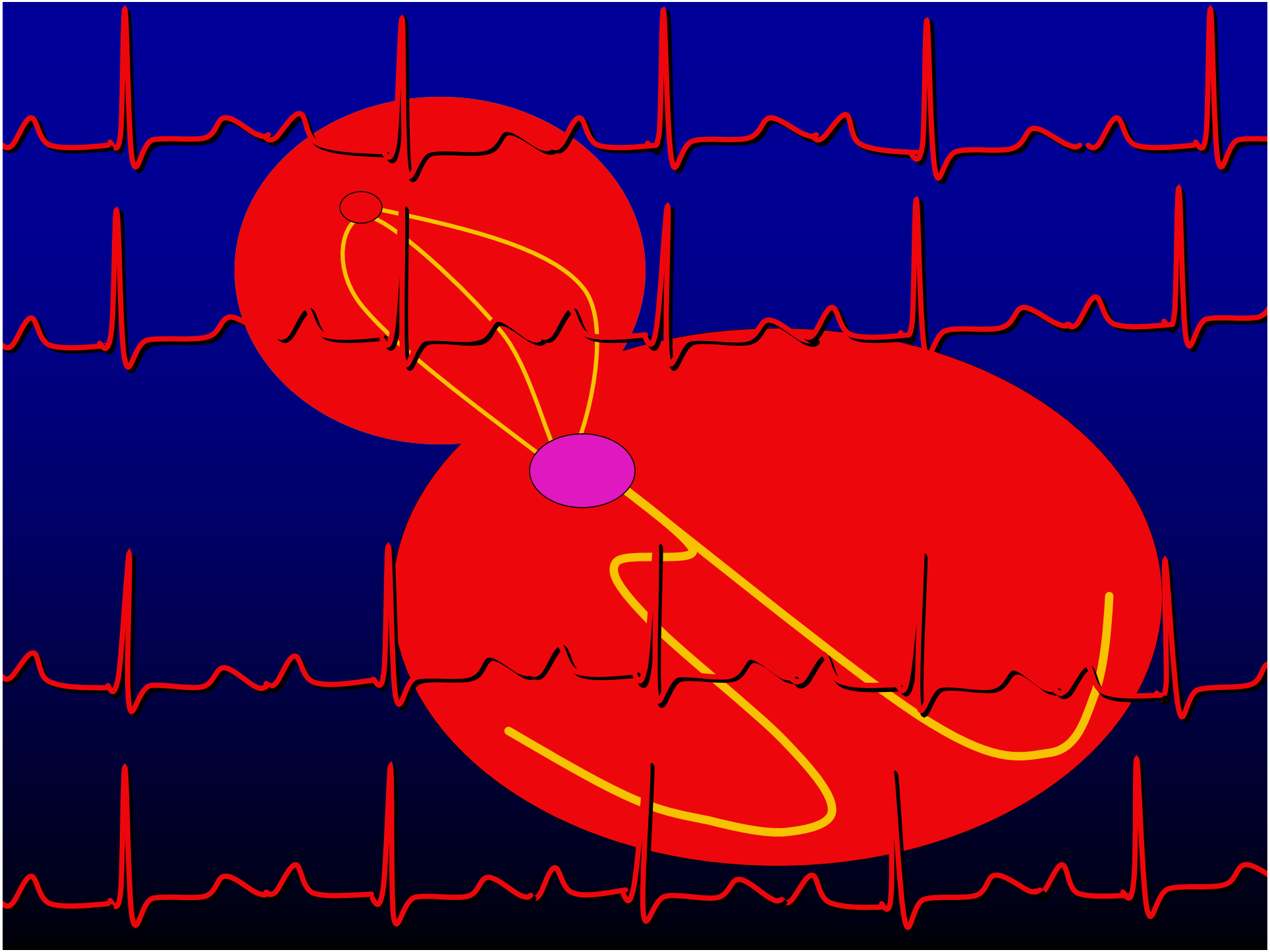




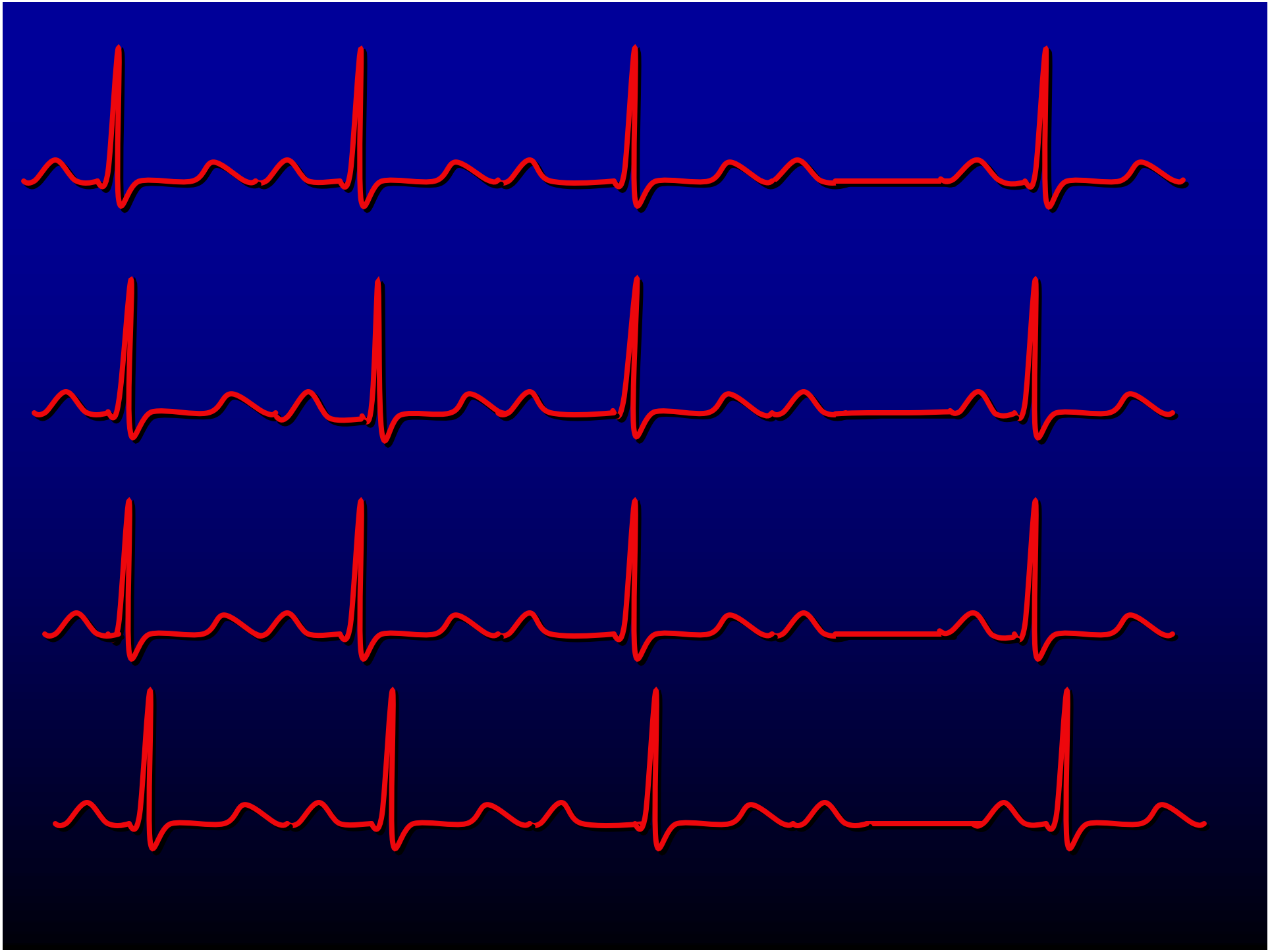
AV node questions:

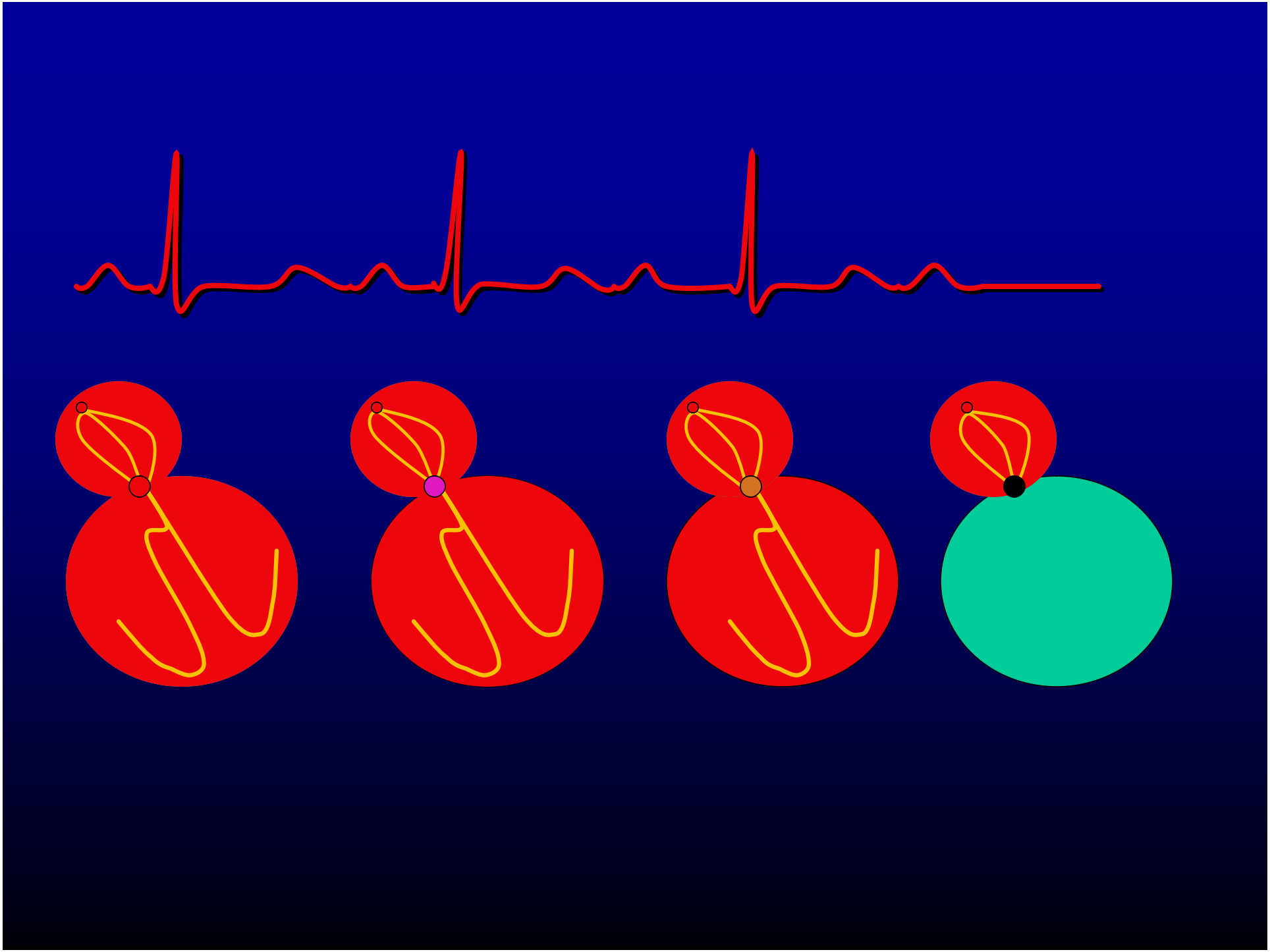
1. Is the PR interval normal?
2. Is it short or long?
3. Does it change?

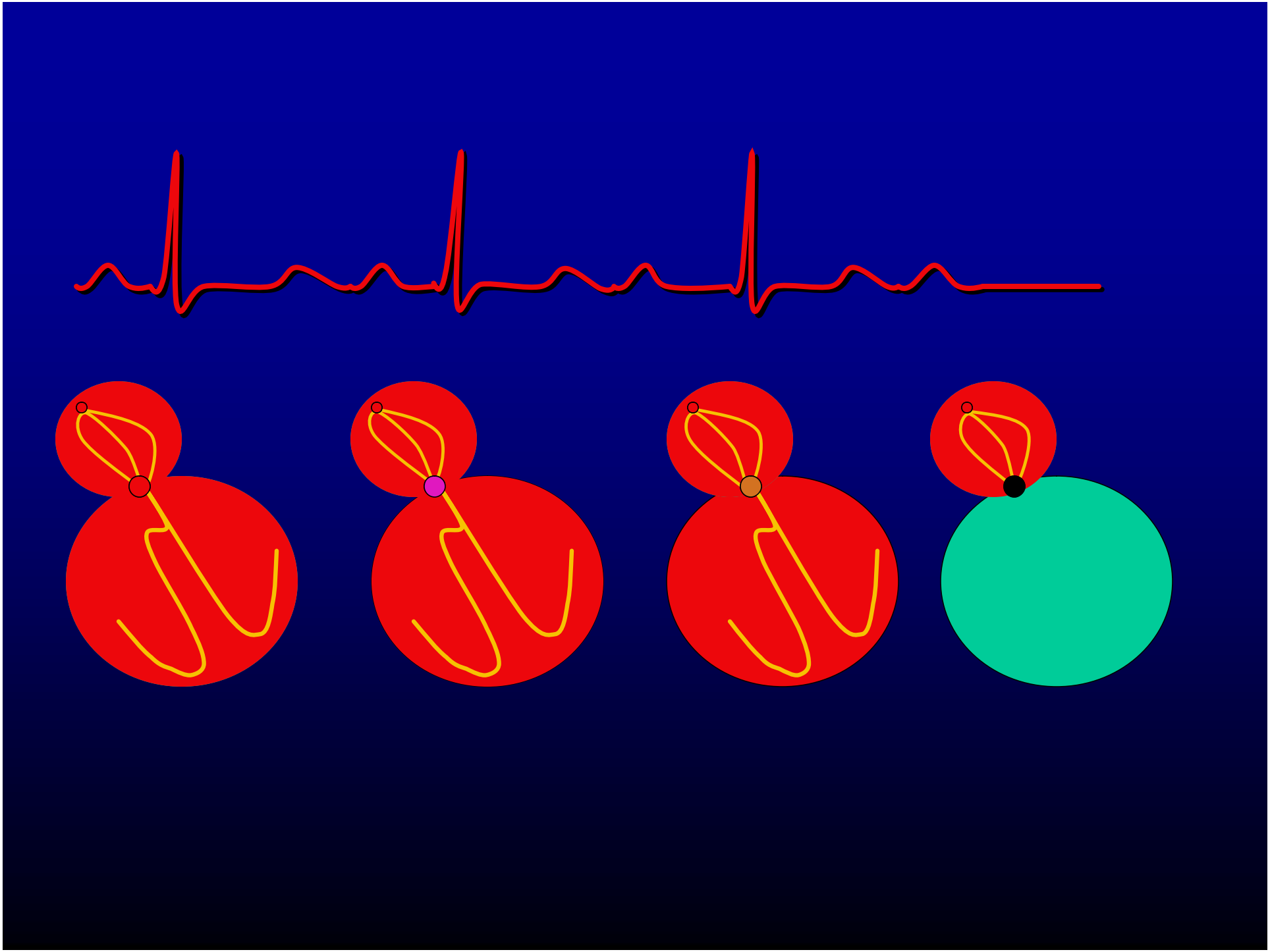
First Degree Block
Type 1

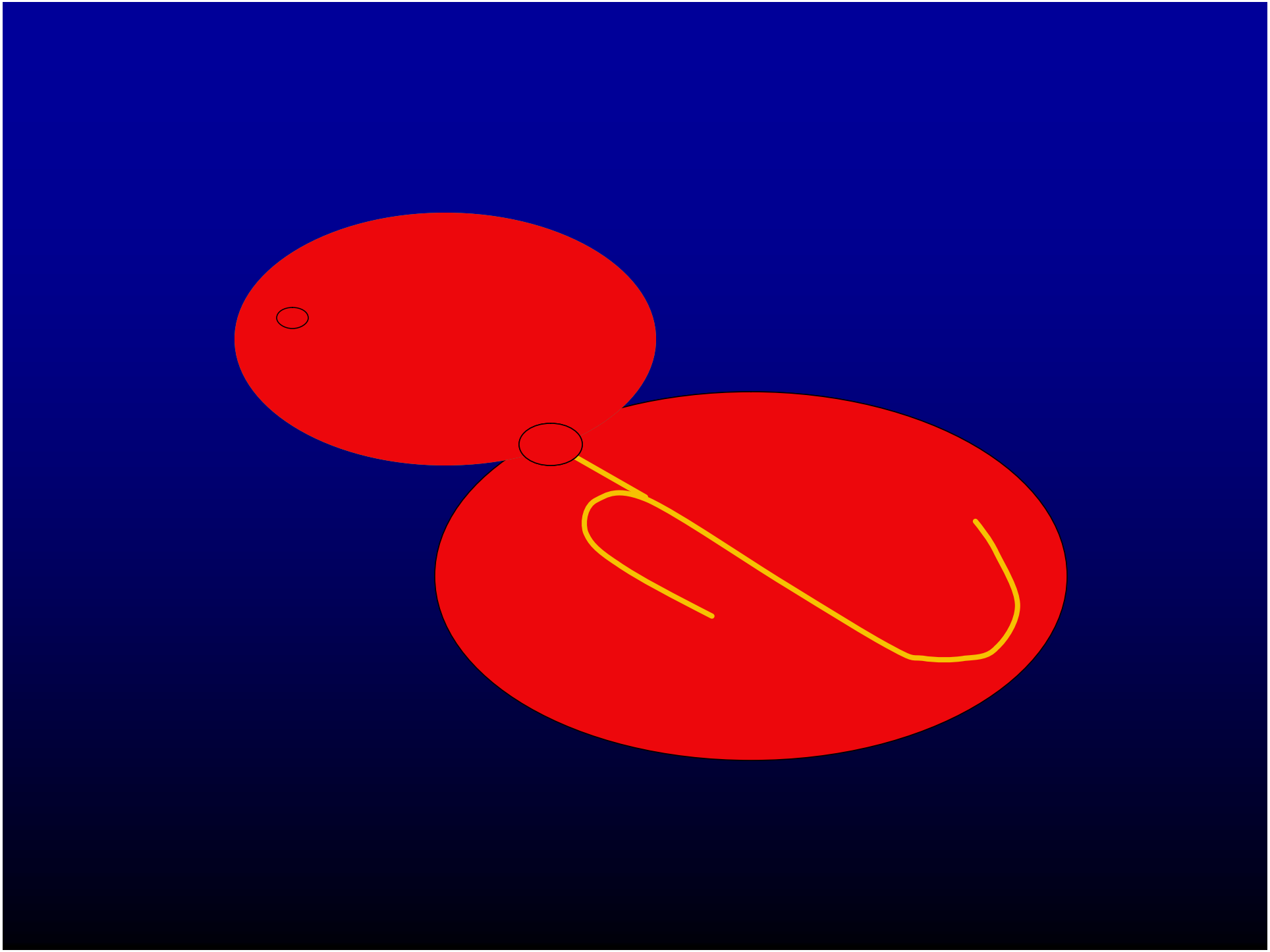


Second Degree Block
Type 1

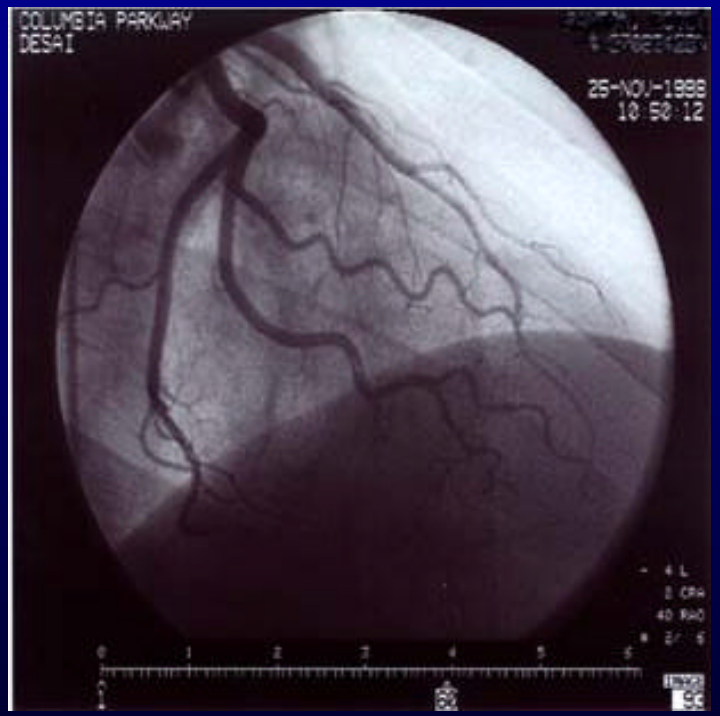


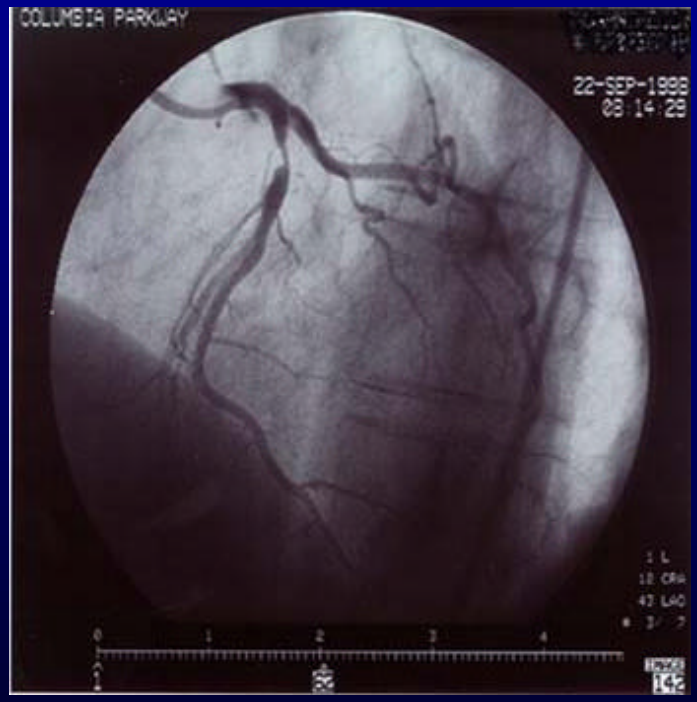




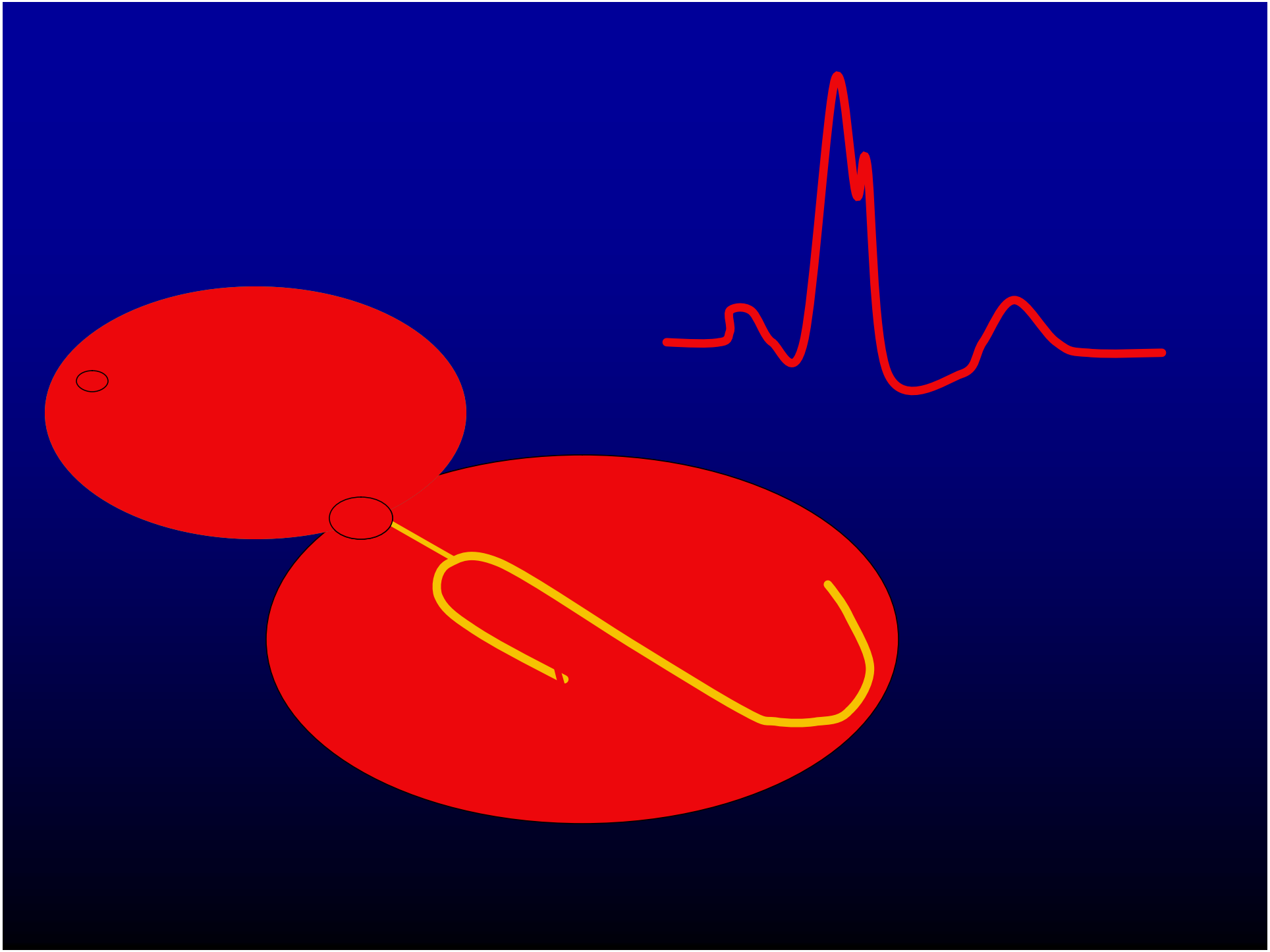


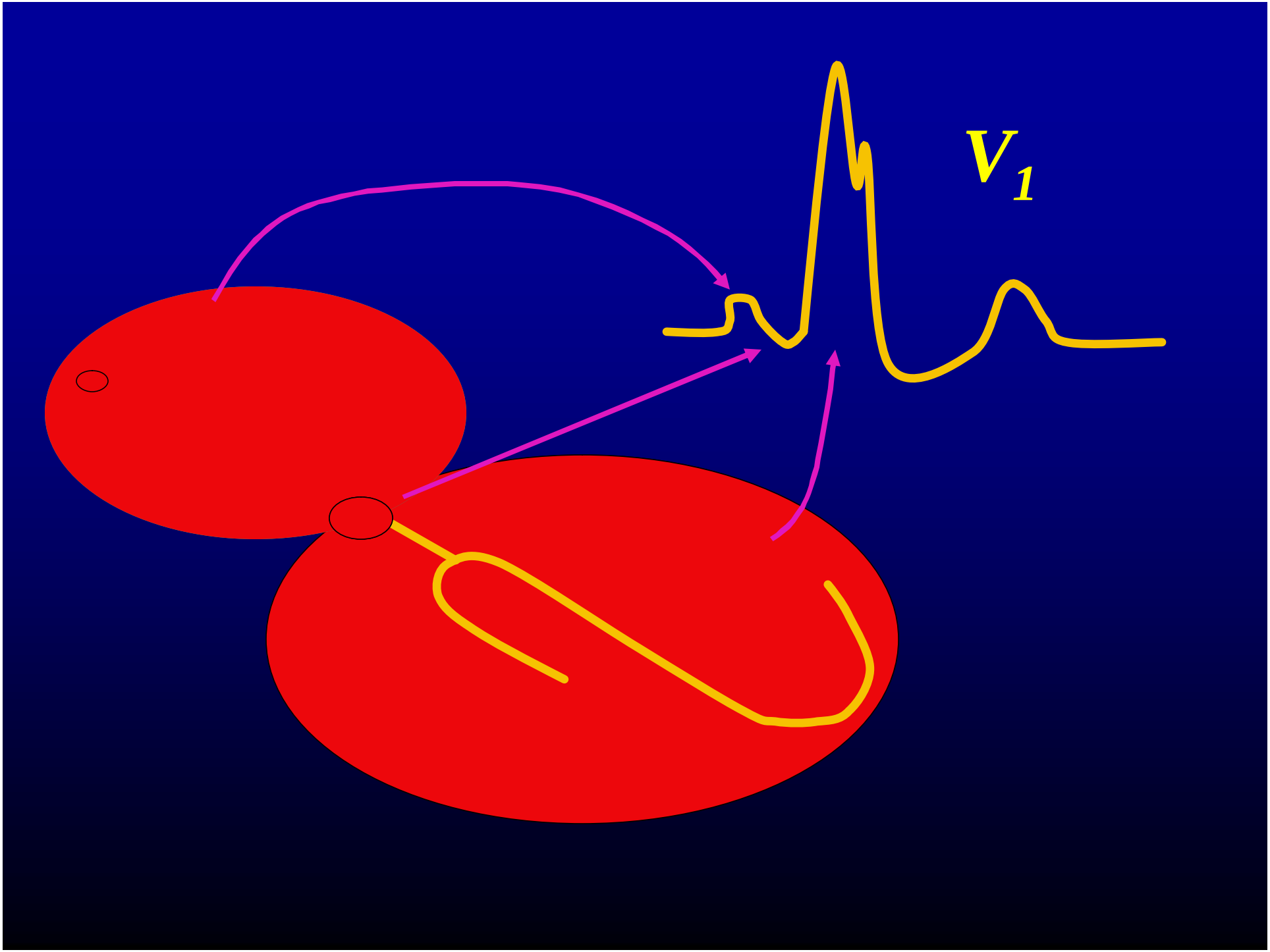
Bundle Branch Problems relate to the Left Coronary Artery

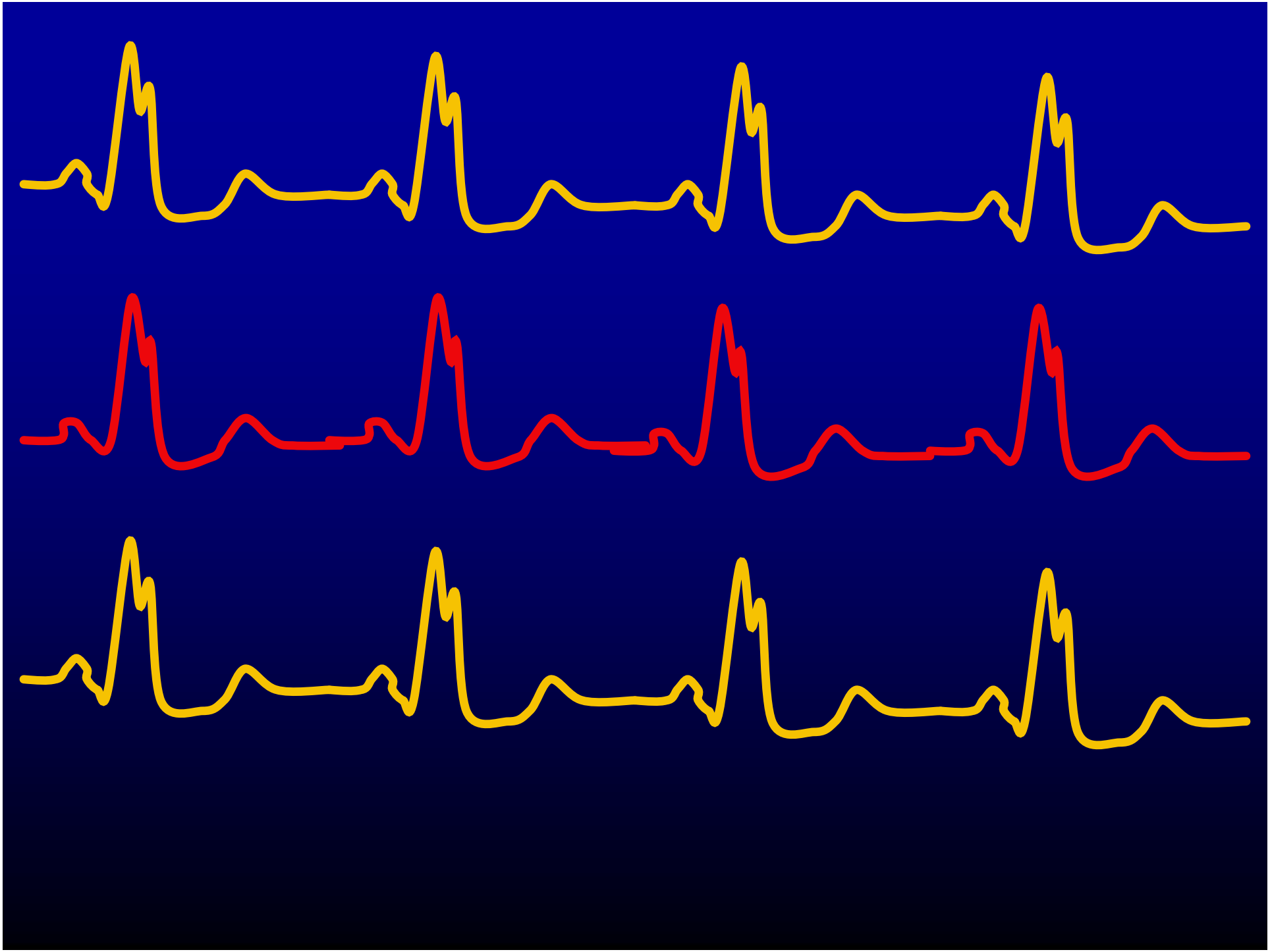


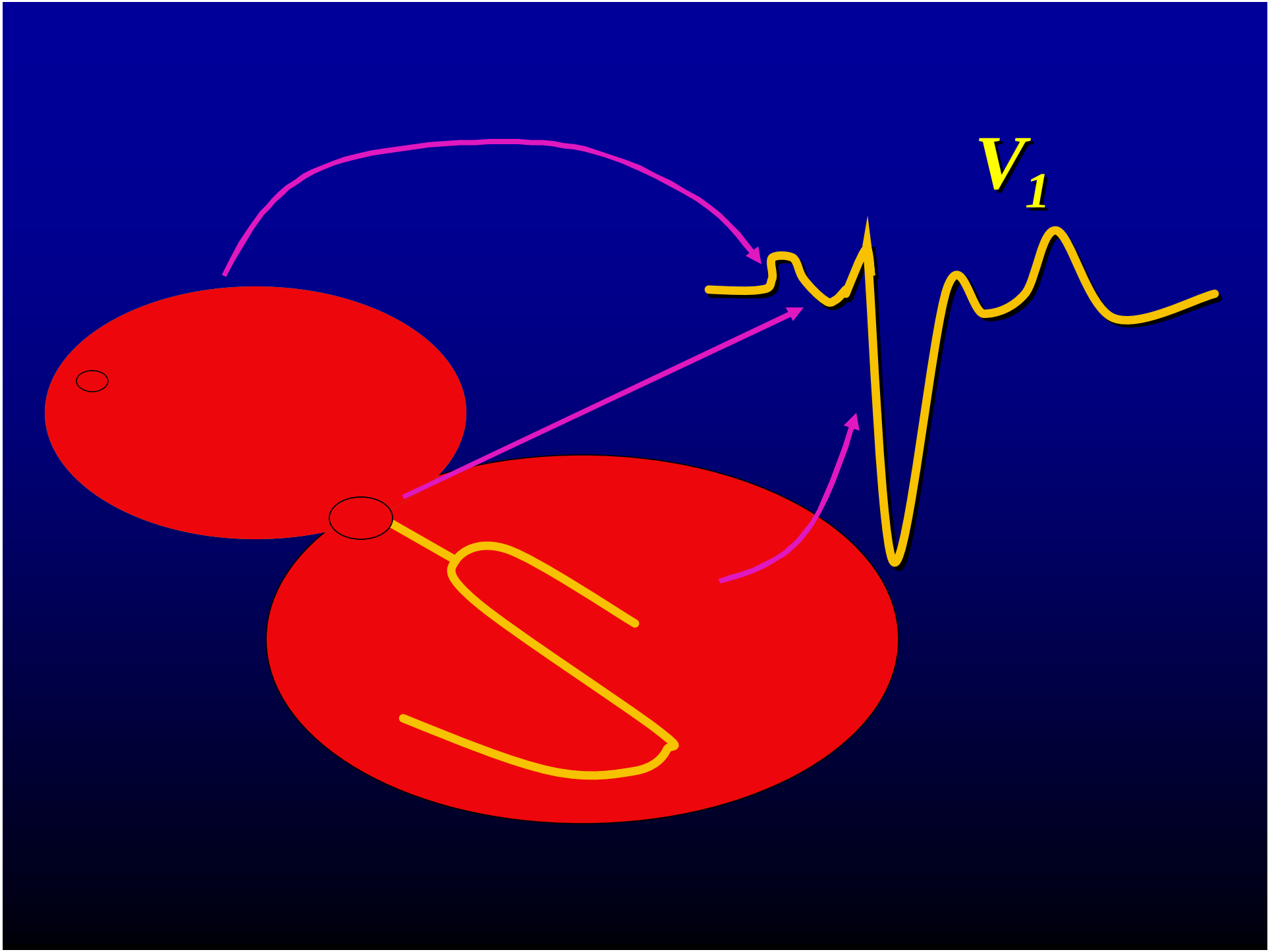



METRIC 1
2
3

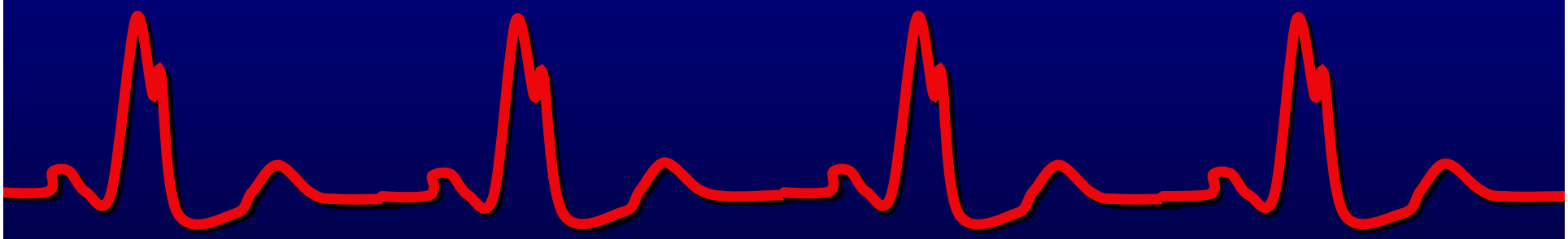



V_1

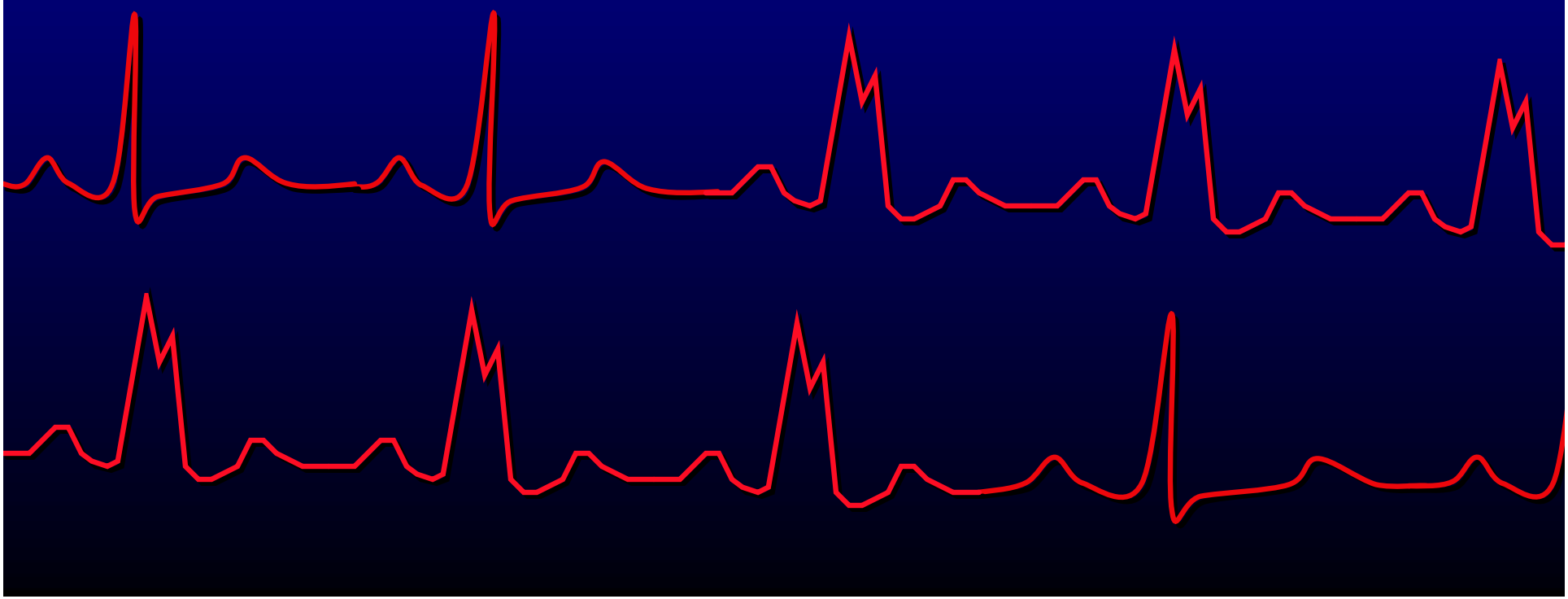



V_1

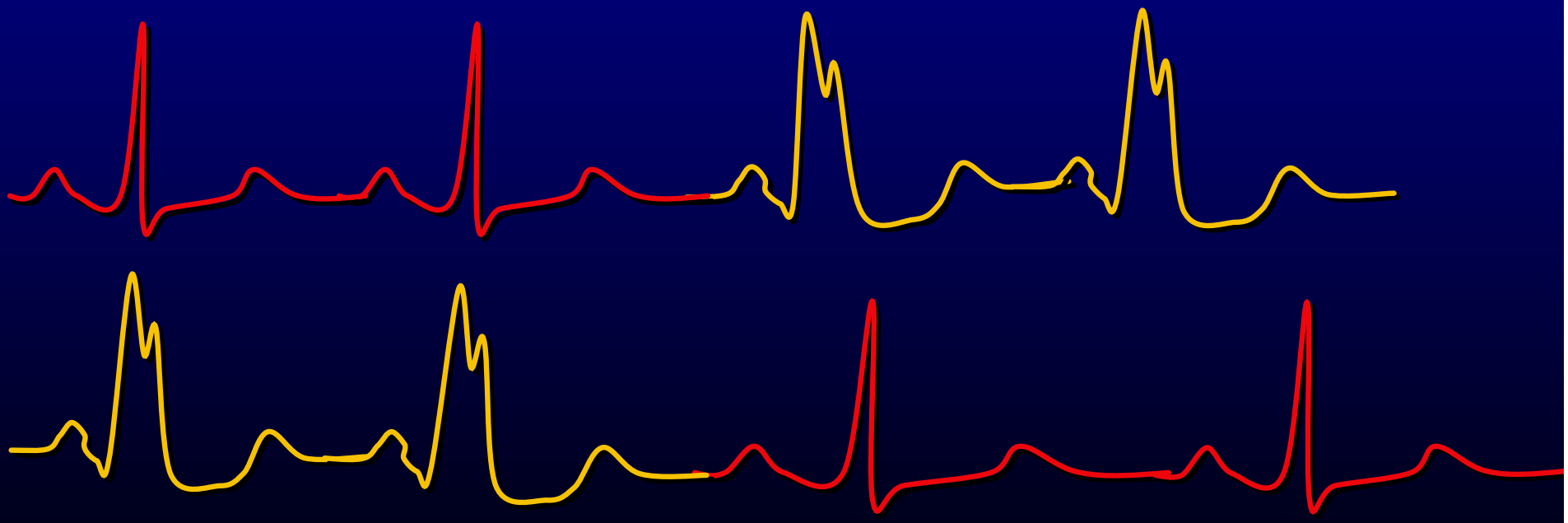
First Degree Block
Type 2, Fixed



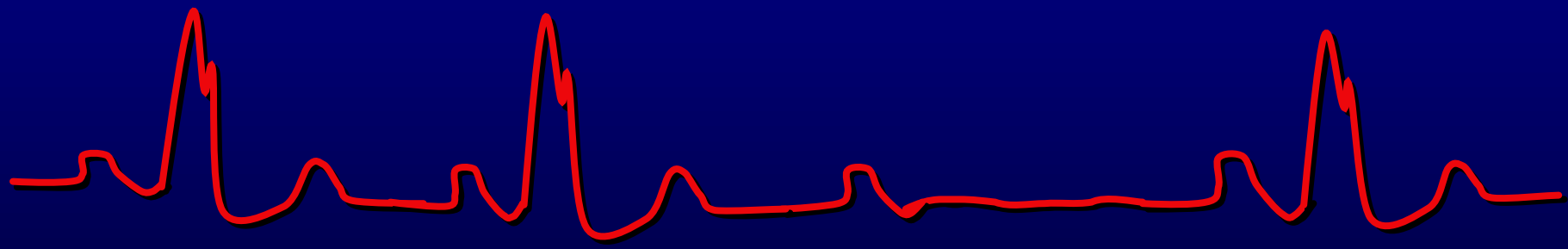
First Degree Block
Type 2, Rate Related

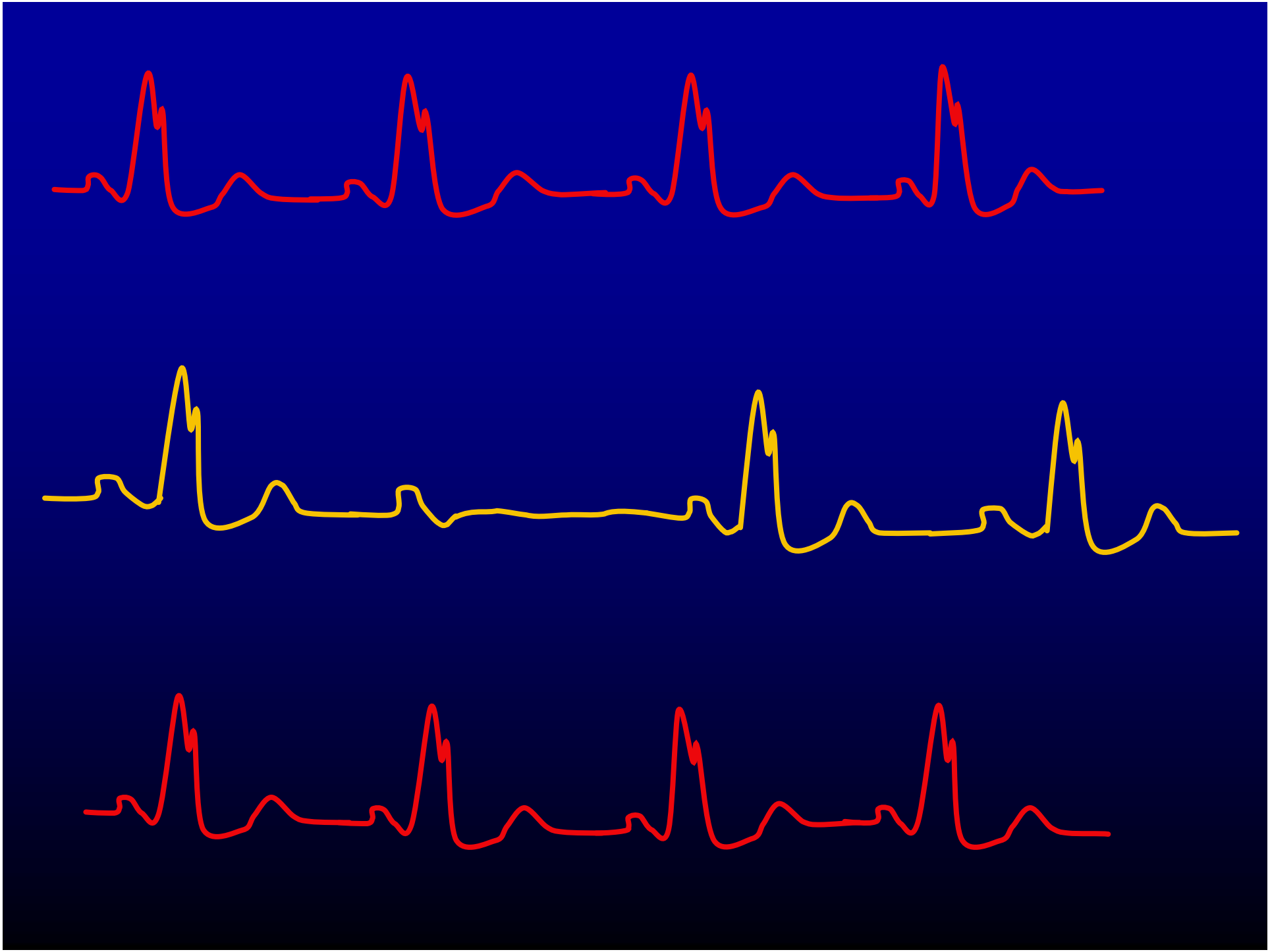


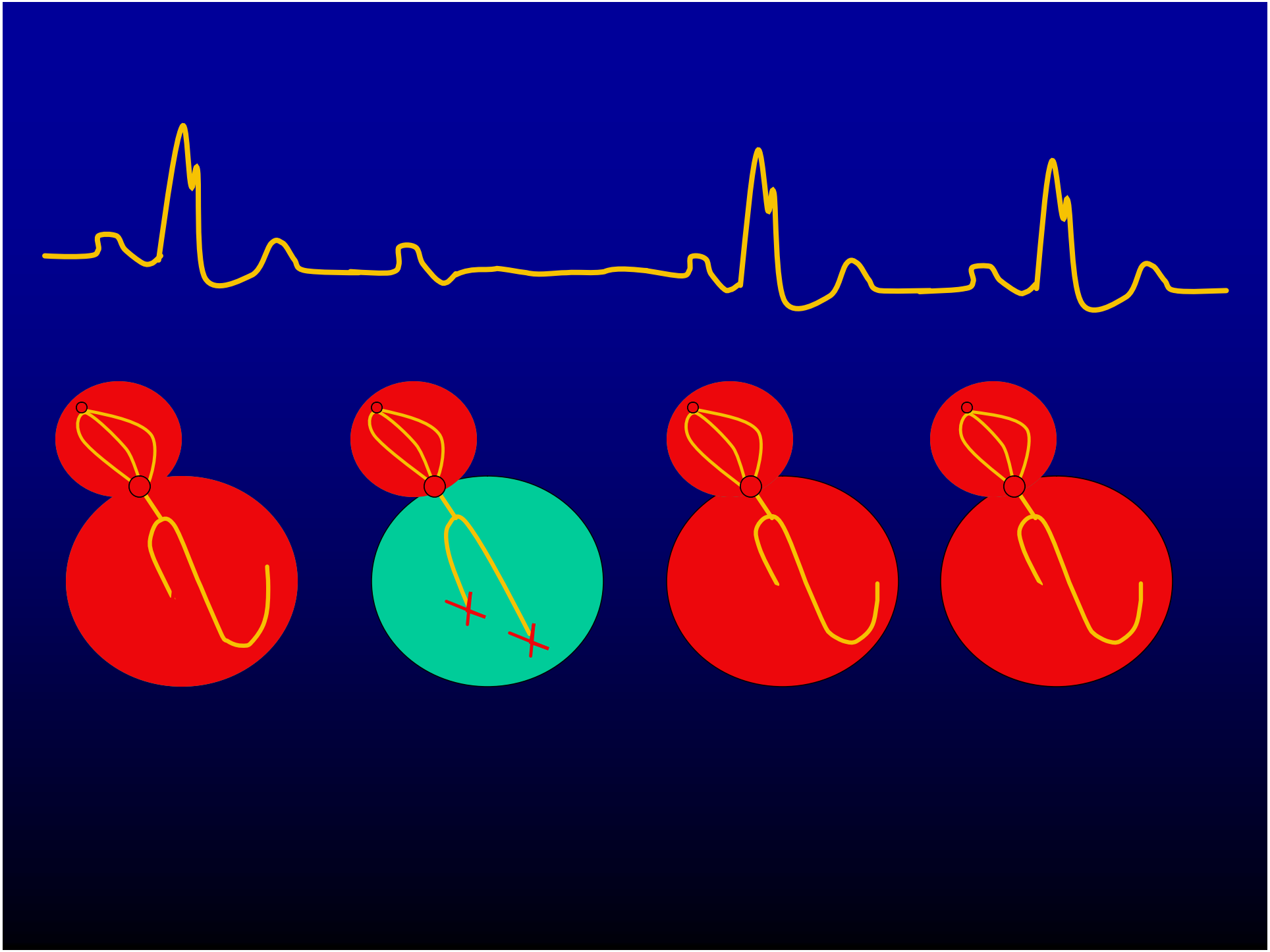
First Degree Block
Type 2, Rate Related

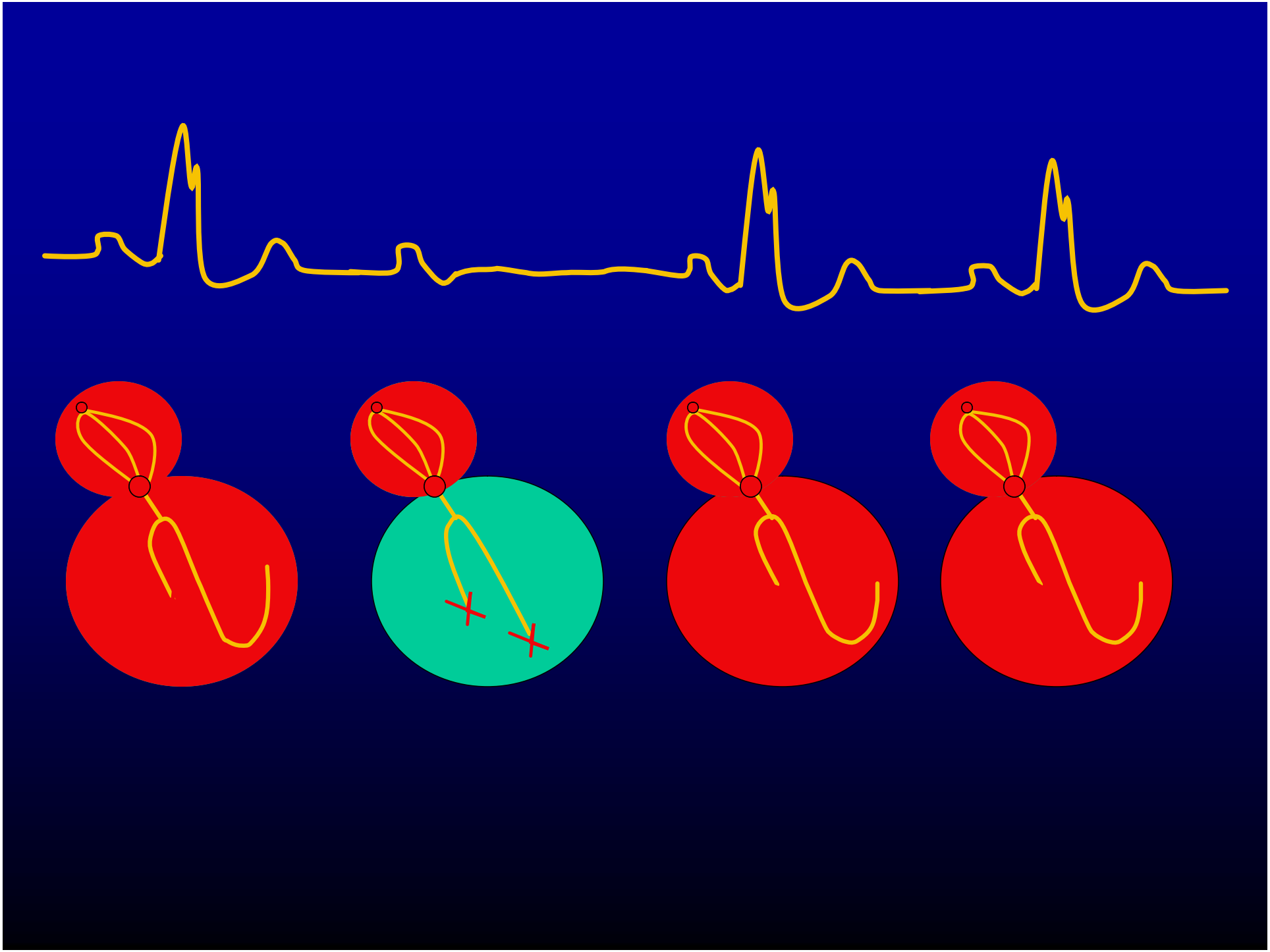


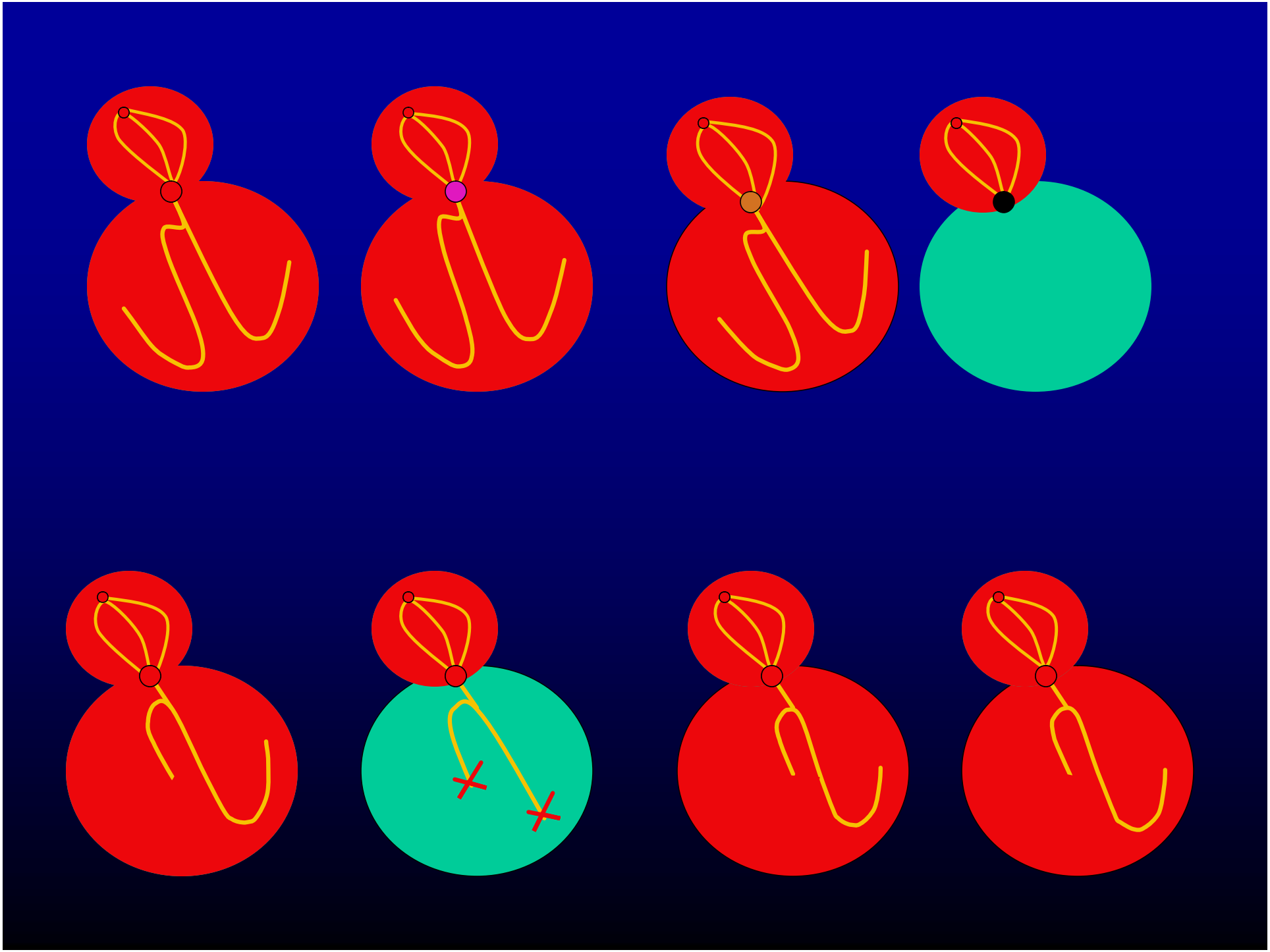
Second Degree Block
Type 2





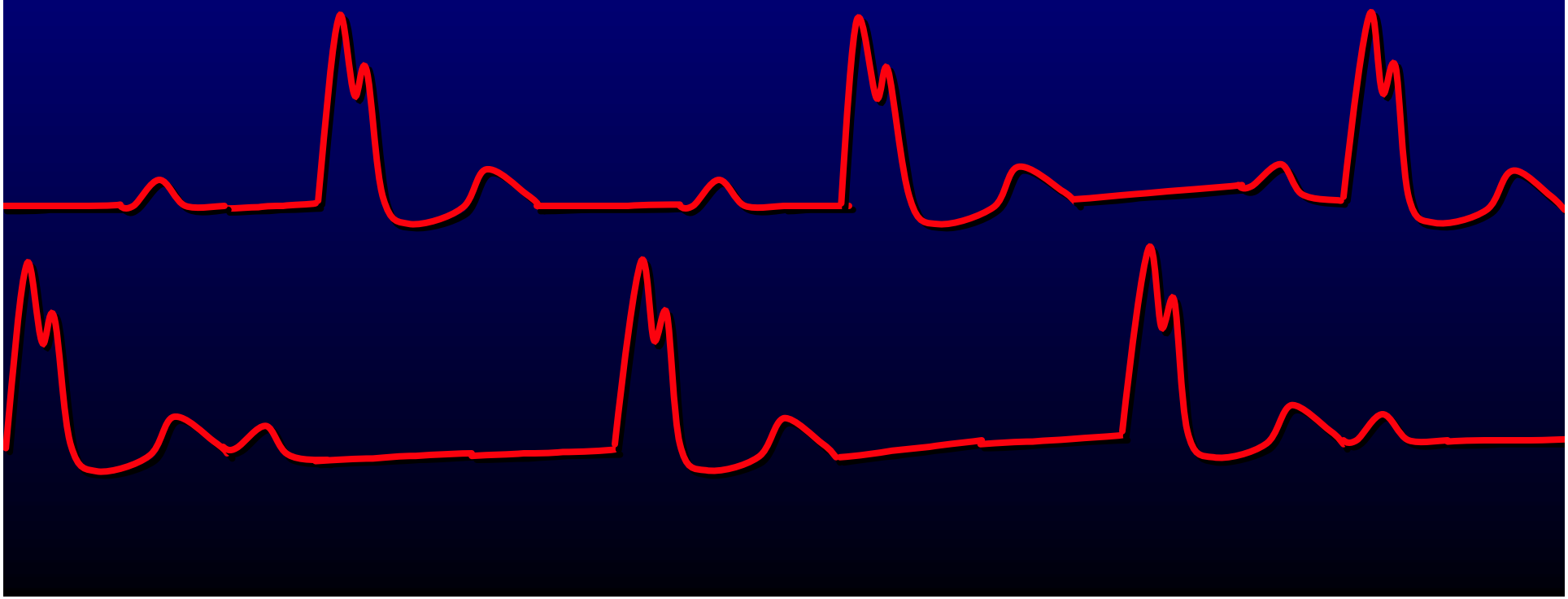


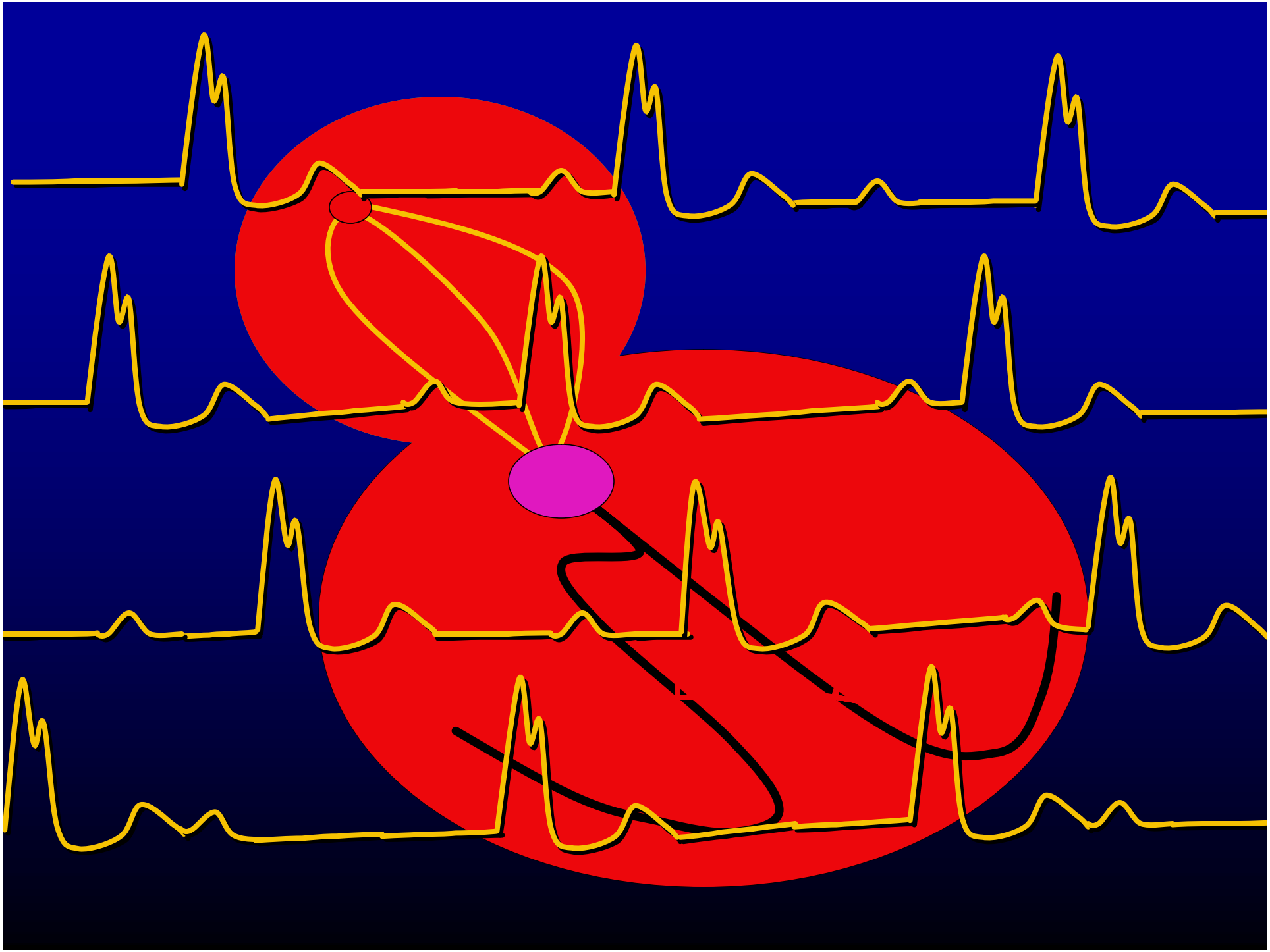




Third Degree Block
Type 1

Third Degree Block
Type 2





For Your Consideration, A *New* Nomenclature:

First Degree: Type 1 - PR Prolongation with narrow QRS
Type 2 – Normal PR with Bundle Branch Block
(Fixed or Rate Related)

Second Degree: Type 1 – Progressive PR Prolonging with narrow QRS
Type 2 - Normal PR with Bundle Branch Block

Third Degree: Type 1 - Narrow Complex with completely variable PR
Type 2 - Wide Complex with completely variable PR

Advanced dilemmas:

- First degree type 2 who suddenly develops a second Degree type 1. How do you know which came first?

- "There's always some error rate in any short cut."

- "No set of rules can be right 100% of the time. We find ourselves asking, 'what is the best compromise?'."

Fowler's Revised AV Block Classification

First Degree: Type 1 - PR Prolongation
Type 2 - Bundle Branch Block (Fixed or Rate Related)

Second Degree: Type 1 - PR Changes
Type 2 - Normal PR with BBB

Third Degree: Narrow Complex with variable PR (AV node block)
Wide Complex with variable PR

00001 02-Mar-1999 11:56:06 AM test, HQ J & J EMS SERVICES UNLIMITED

50 Years Male 145 lbs Blood Pressure: 100/80

Rate	71
PR	164
QRSD	136
QT	345
QTc	375

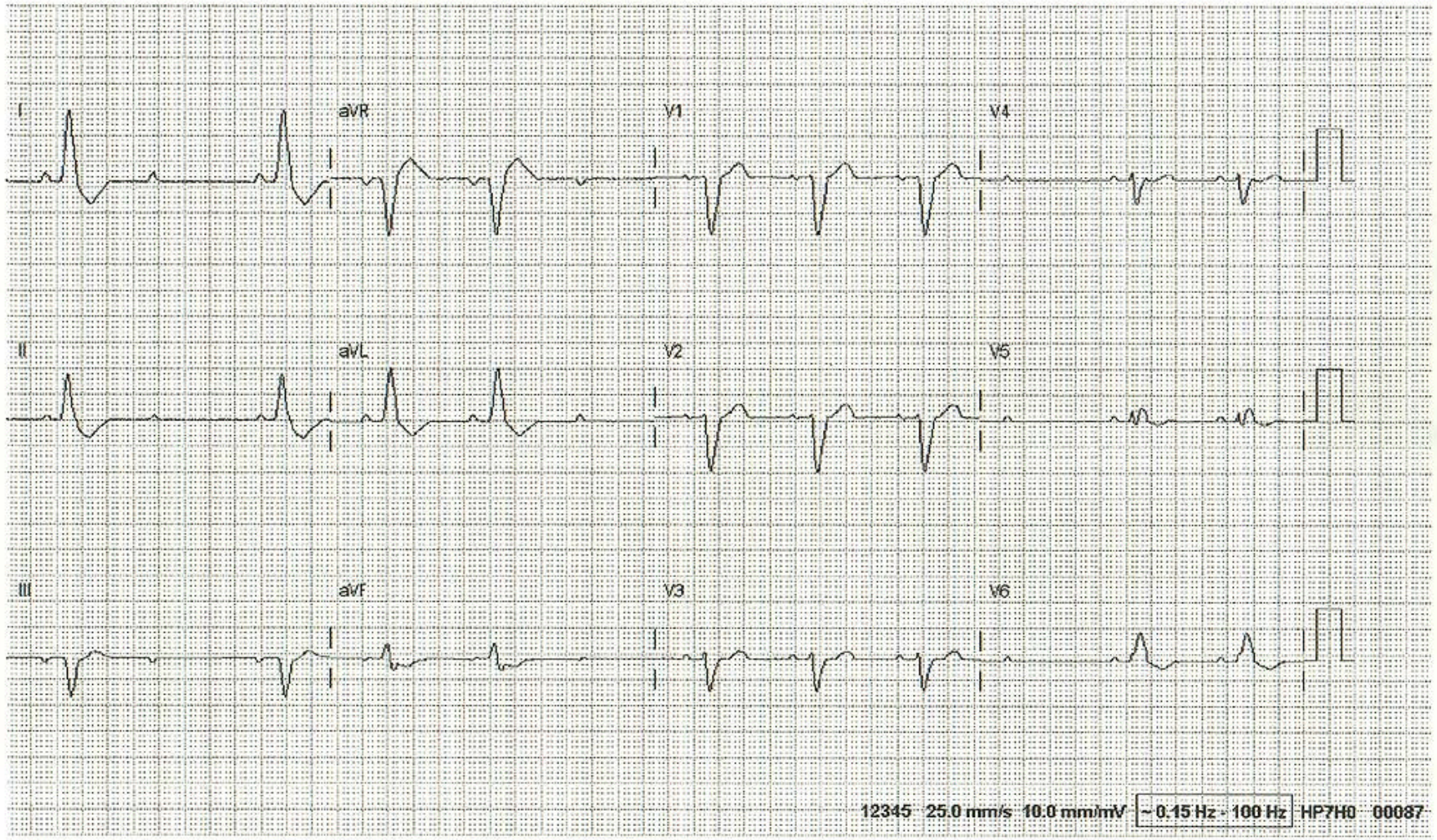
Axis	
P	-2
QRS	3
T	193

. Patient's ECG DOES NOT meet ST criteria for acute MI or ECG DOES NOT meet inclusion criteria for TPI analysis.
. ... QRS duration detected is > 130 ms
. ... LBBB Detected
. Time since acute ischemic symptom: 20 Min.; Hx: Diabetes, Hypertension

smoker
y

Requested by:

Unconfirmed diagnosis.

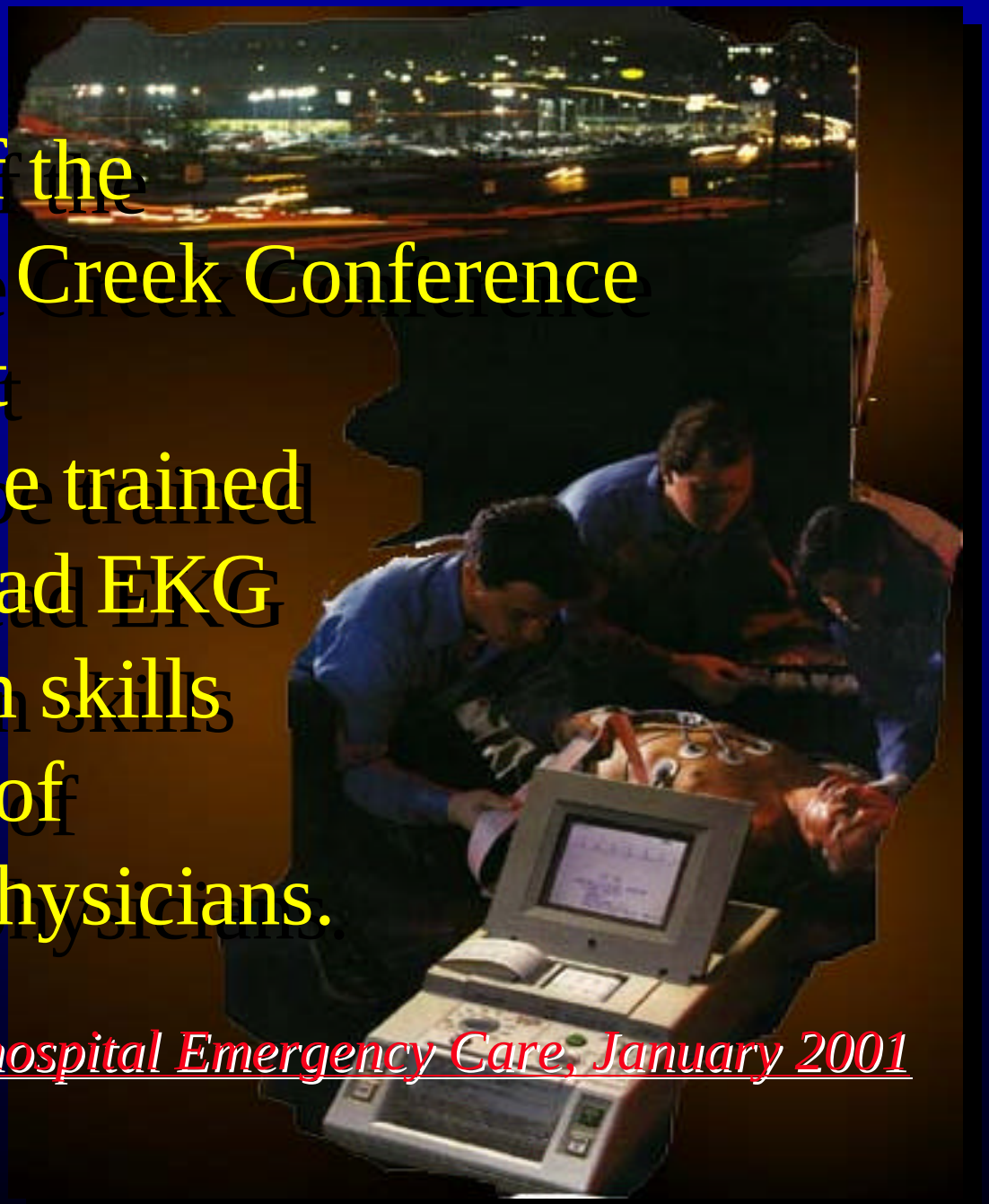


Synthesis

Summary Musings:

- **Block is not well explained by the experts, and providers wrestle with it**
- **Understanding what is happening anatomically makes understanding what you see on the EKG easier**
- **The higher grade blocks (Type 2 and 3rd degree) imply grave clinical problems and require rapid recognition and response**

The report of the recent Turtle Creek Conference indicates that medics can be trained to have 12 lead EKG interpretation skills rivaling that of emergency physicians.



Prehospital Emergency Care, January 2001


Let us then
apply our best efforts
in training and periodic retraining
with the sharpened focus
of clarity and simplification,
pooling our individual creativities
for the greater good
of those we serve.

Ray Fowler, M.D., FACEP

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