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
Patient's ECG does not meet ST criteria for acute MI or ECG does not meet inclusion criteria for 7TI analysis.

QRS duration detected is > 130 ms

LBBB Detected

Time since acute ischemic symptom: 20 Min.; Hx: Diabetes, Hypertension

Requested by: [Signature]

Diagnosis: Unconfirmed diagnosis.
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
<table>
<thead>
<tr>
<th>Type of Block</th>
<th>Need for Permanent Pacemaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV Nodal of any sort</td>
<td>&lt; 1%</td>
</tr>
<tr>
<td>Mobitz 2 and InfraHIS type 3</td>
<td>99%</td>
</tr>
</tbody>
</table>
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

1\textsuperscript{st} (All)
Prolonged PR, Fixed or Variable
Bundle Branch Block, Either Fixed or Rate Related

2\textsuperscript{nd} (Some)
RP-PR Reciprocity (usually Prolonging PR)
Bundle Branch Block, Normal PR

3\textsuperscript{rd} (None)
Variable PR, Narrow Complex

Type 2

Prolonged PR, Fixed or Variable
Bundle Branch Block, Either Fixed or Rate Related

RP-PR Reciprocity (usually Prolonging PR)
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
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
Patient's ECG does not meet ST criteria for acute MI or ECG does not meet inclusion criteria for PCI analysis.

QRS duration detected is > 130 ms

LBBB Detected

Time since acute ischemic symptom: 20 Min.; Hx: Diabetes, Hypertension

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

drray@
doctorfowler.com

www.doctorfowler.com