Pathologic LAD (Left Axis Deviation)

As seen in the Figure below — after the electrical impulse arrives at the AV Node — it travels down the Bundle of HIS. From there, the ventricular conduction system divides into the slender Right Bundle Branch — and — the much thicker Common Left Bundle Branch.

• The Common Left Bundle Branch divides into 2 parts: the Anterior and Posterior Hemifascicles. A hemiblock is simply a defect in conduction in one of these hemifascicles.
• Note in the Figure that the posterior hemifascicle is anatomically much thicker than the anterior hemifascicle. This is one reason why LPHB is rare.

Simplified Diagnosis of Hemiblocks:
Fortunately — ECG diagnosis of hemiblocks can be simplified. There are only 2 hemiblocks: anterior or posterior.

► Left Anterior HemiBlock (LAHB) — is far more common. In our experience, up to 98-99% of all hemiblocks are LAHB. Therefore — IF you have a hemiblock but don’t know which one — Guess LAHB! You’ll be correct 99% of the time.
• Diagnosis of LAHB is easy! — All one needs is pathologic LAD (which we define below).

► Left Posterior HemiBlock (LPHB) — is rare! There are 2 reasons:
  • The posterior hemifascicle is much thicker anatomically.
  • The posterior hemifascicle has a dual blood supply (from left and right coronary arteries); the ant. hemifascicle does not.
  • Even experts often have trouble diagnosing LPHB. As a result — You are probably none the worse if you never diagnose LPHB (On those rare occasions when LPHB does occur — it will usually be seen in association with RBBB as a bifascicular block).
**LAHB/Pathologic LAD**

Even expert electrocardiographers do not agree on how to define LAHB. Some define it by the number of degrees *(be this requiring a leftward axis of more than -30°, -45°, or -60°)*. Others maintain that it is not axis at all — but rather QRS morphology in the limb leads that defines LAHB. Life is “simpler” *(and equally accurate)* — IF you equate pathologic LAD = LAHB.

- Some LAD (ie, -10° to -20°) — is not necessarily abnormal.
- We define a **pathologic LAD** as a left axis more negative than -30°.
- It is easy to tell IF a pathologic LAD is present. **All you need do is look at lead II.** Assuming lead I is positive *(as it almost always is)* — then the amount of LAD is **“pathologic”** — IF the net deflection in Lead II is negative *(See Figure below)*.

![Diagram showing pathologic LAD diagnosis](image)

### KEY Summarizing Point —

For practical purposes, we equate the ECG diagnosis of LAHB with the finding of pathologic LAD *(which we define as a mean QRS axis more negative than -30°)*.

- One need only look at lead II to make the diagnosis of **pathologic LAD** *(Figure above)*. IF the net QRS deflection in lead II is more negative than positive — then the mean QRS axis **must** be more negative than -30° *(which means there is LAHB)*.
**Tracing P** — Determine the mean QRS Axis for the 12-lead ECG shown below. A blow-up of the 3 essential leads for doing this is seen at the bottom of the page.

► **Answer** to **Tracing P** *(Axis determination)*:
- **Lead I** *(at 0°)* shows a net positive QRS deflection. This puts the axis in the left hemisphere.
- **Lead aVF** *(at +90°)* shows a predominantly negative QRS deflection. This means there is LAD *(Left Axis Deviation)*. To determine IF there is enough LAD to be a LAHB, we **look at Lead II**:
  - Because the net QRS deflection in **Lead II** *(at +60°)* is more negative than positive — there is pathologic LAD *(i.e., a mean QRS axis of more than -30°, which qualifies for LAHB)*.
- **Bottom Line**: — **Lead II** holds the KEY for determining IF there is LAHB.
We use the term **“bifascicular” block** to imply that *more* than a single major branch of the ventricular conduction system is blocked. Practically speaking — there are **2 Types of Bifascicular Block:**

- **RBBB/LAHB** = RBBB *plus* LAHB
- **RBBB/LPHB** = RBBB *plus* LPHB

Semantically — **complete LBBB** is also a type of “bifascicular” block — since there is implication of failed conduction (*by definition*) in *both* anterior and posterior hemifascicles when there is LBBB...

► **RBBB/LAHB** — is the **bifascicular block** most commonly seen. **RBBB** is diagnosed by QRS widening and QRS appearance in leads I,V1,V6. The *negative* QRS complex in lead II tells us that *in addition to RBBB* — there is also **LAHB** *(Figure).*
RBBB/LPHB — is rare. The KEY to recognition is that lead I manifests a deep straight descent to the S wave when there is LPHB as well as RBBB.

- Lead II (and also lead III) show the opposite (mirror image) configuration of lead I when there is LPHB (small q; tall R).

Clinical Implications of Bifascicular Block:

The clinical significance of virtually any conduction system defect depends on the setting in which it occurs. Isolated RBBB may sometimes occur in otherwise healthy individuals — in which case it may not necessarily have prognostic implications. In contrast — the new finding of RBBB in the setting of a patient with acute evolving MI implies ongoing conduction system damage (with a potentially larger infarction and possible need for a pacemaker).

- Bifascicular block clearly implies a more important conduction defect than isolated RBBB. That said — IF the patient is otherwise asymptomatic, then RBBB/LAHB may not necessarily have prognostic implications. But — IF new RBBB/LAHB develops in the setting of acute coronary syndrome — the extent of damage is probably large (and the patient may soon need a pacemaker).

- RBBB/LPHB is rare. However, IF it occurs — it implies a much more extensive conduction system defect (with potentially much more severe prognostic implications).