

# Common ECG Abnormalities: What the Family Physician Should Not Miss



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## Some Examples of ECG

## Basic ECG approach

Electrocardiogram remains one of the most basic investigations of the heart and has been available for over 100 years, since Einthoven used an electrometer to distinguish five electrical deflections, which he named the P, Q, R, S and T waves.<sup>1</sup>

It is not possible to give examples of every condition that “should not be missed” but the following four examples, illustrate times when a working understanding of ECG interpretation may allow more rapid diagnosis of the patient’s problems and improve their care.

- Rate
- Rhythm
- Intervals/axis
- Assess for major abnormalities: hypertrophy, infarction, conduction abnormalities
- Anything else that stands out

### Case 1: Meet Ronny...

Ronny is a 71-year-old man with a history of hypertension who has experienced 30 minutes of chest pain that improved after two sublingual nitroglycerine tablets.



### What are the ECG findings?

This ECG shows a heart rate of 80 bpm, PR interval - 0.14 second, QRS - 0.09 second, and QRS frontal plane axis +10 degrees. There is sinus rhythm with prominent T waves and slight ST elevation leads V1-V3 and reciprocal ST segment depression leads I, aVL, II, and V5 and V6. This is concerning for an acute anterior ischemic event. There is prominent QRS voltage and LVH is possible and there is one PVC. Ronny had ST elevation leads V1 – 3, with the next bout of chest pain and subsequent stenting to a proximal left anterior descending coronary artery stenosis.

**Case 2: Meet Sophia...**

Sophia is an 18-year-old female who has had syncope three times with menstrual cramps. She is not on any medications.

**What are the ECG findings?**

HR-50 bpm, PR-0.14 sec., QRS-0.1sec., QT-0.68sec., QTc-0.56sec., Axis- +50°

This shows a long QT interval, as seen best in leads V4 and V5 where the extent of the QT interval is more apparent. The measured QT interval is 0.68 seconds with a corrected QT interval of 0.56 seconds. (Corrected QT interval = measured QT interval (in seconds) /  $\sqrt{\text{preceding RR interval}}$  (measured in seconds)). This is consistent with the long QT syndrome, given the patient's age and history and is associated with a form of ventricular tachycardia called torsades de pointes.

The cause of QT interval prolongation may be congenital or acquired. This case is consistent with the congenital long QT syndrome. There are excellent websites:

- (<http://www.azcert.org/medical-pros/drug-lists/drug-lists.cfm>,
- <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1767957/>) and articles that list medications of concern and other causes.<sup>2</sup>

**Case 3: Meet Alexander...**

Alexander is a 74-year-old man with shortness of breath, worsening over the last three weeks. He has findings of decompensated heart failure. His medications include Metoprolol 25 mg BID, Lisinopril 10 mg q.d., ASA 81mg q.d.

**What are the ECG findings?**

Atrial rate-280 bpm, ventricular rate 130 to 150 bpm, QRS- 0.11 second

This ECG shows atrial flutter with variable AV conduction. Lead V1 shows two P waves for every QRS complex however the ventricular response is still sometimes irregular. There are non-specific ST T changes.

This patient may have the atrial flutter, because of his heart failure or the atrial flutter and rapid ventricular response may have caused the heart failure. The distinction is important but in either case the rate must be slowed, anti-coagulation begun if possible, and investigations of the heart performed, usually starting with echocardiography to assess ventricular function. The heart failure would be treated with diuresis, ACE inhibition, and beta-blockade (also for slowing the heart rate).



#### Case 4: Meet Elisa...

Elisa is a 73-year-old woman presenting with fatigue, which began three weeks ago. Medications include Diltiazem CD 120mg q.d.



#### What are the ECG findings?

Atrial rate= 64, Ventricular rate= 32, QRS-0.14 sec., Diagnosis- Complete AV block

This represents complete heart block with a wide QRS complex escape rhythm. The escape rhythm is likely from the ventricle, but a junctional escape rhythm in a patient with pre-existing left bundle branch block is also possible. This patient requires a permanent pacemaker, even though she is using a small amount of the rate slowing calcium channel blocking agent, diltiazem.

### *Efficacy of the ECG Test*

The ECG is an excellent test that can be performed early, easily, and inexpensively. It remains a valuable part of the testing of patients with CVD. There are books and courses for learning more about ECG interpretation, as well as good websites, with examples for individual practice. Though it can suffer from lack of sensitivity and specificity, it is most useful in assessing conduction abnormalities, rhythm disorders, hypertrophy, and acute problems such as ischemia *etc.* It is usually not useful in looking

for transient problems *e.g.* palpitations. The test should be performed in most cases where heart disease is suspected.

**cme**

#### References

1. Einthoven W. Ueber die Form des Menschlichen Electrocardiograms: Arch f. d. Ges. Physiol 1895; 60:101-123
2. Roden DM. Drug-Induced Prolongation of the QT Interval: N Engl J Med. 2004; 350:1013-1022

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