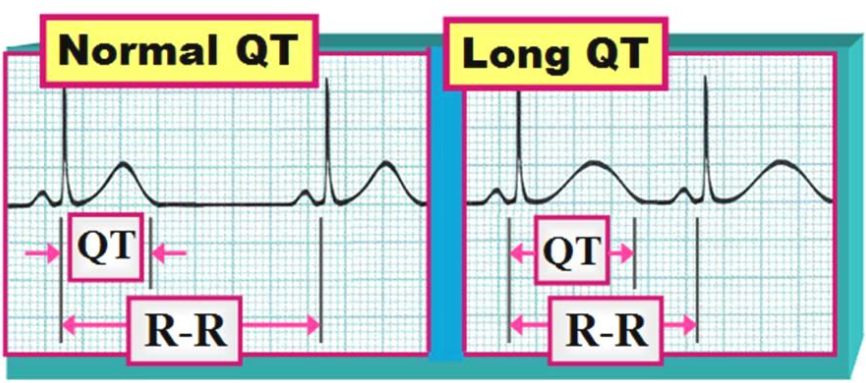
The QT Interval

The ***QT interval*** is the period that extends from the *beginning* of ventricular depolarization — until the *end* of ventricular repolarization **(***Figure below***)**. For practical purposes, the QT is ***prolonged*** — IF it clearly measures ***more*** than **half** the R-R interval. The principal exception to this rule is when the heart rate is rapid **(***>90-100 beats/minute***)** — in which case it is more difficult to measure the QT and determine its clinical significance.

- ***To measure the QT*** — Choose a lead where you can clearly see the *end* of the T wave. *Select that lead in which the QT appears to be longest.*



►***Is the QT prolonged?***

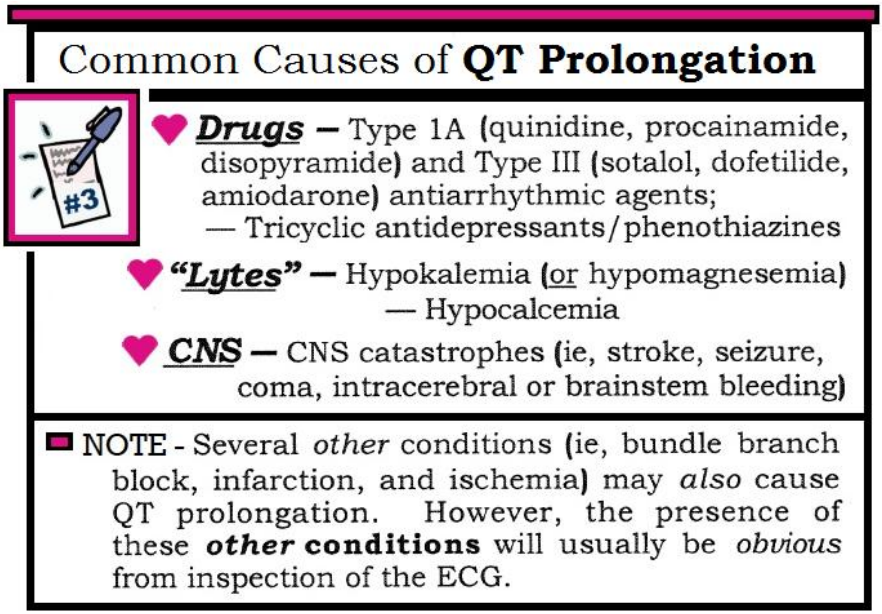
- Answer — The QT interval is clearly *normal* on the left **(***since the QT is much less than half the R-R interval***)**. In contrast — the QT is obviously *long* on the right **(***it far exceeds half the R-R interval***)**.

Clinically — We want to know IF the QT is normal or long. This is usually easy to tell by the above ***"eyeball method"*** **(**ie, *Is the QT more than half the R-R interval?***)** — provided that the heart rate is *not* excessively fast (*not over 90-100/minute*).

- Practically speaking — one *only* cares IF the QT interval is normal, borderline, or long. **(*Hypercalcemia*** produces **QT shortening** — but this is *difficult* to recognize clinically and is usually only seen with very high serum calcium values of >12 mg/dL.**)**

CAUSES of QT Prolongation

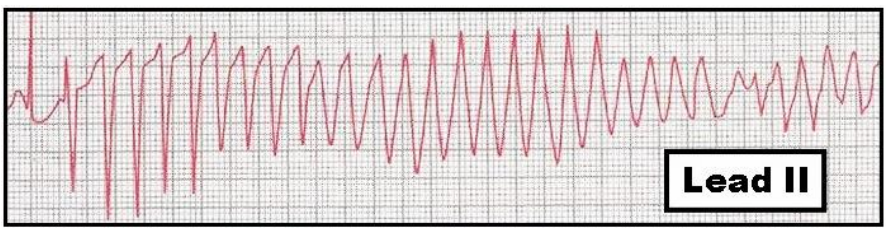
It is important to be aware of the **Causes** of **QT *prolongation***. There are *many*. Fortunately — the most common causes can be divided into 3 basic categories = ***"Drugs/Lytes/CNS"*** **(***List #3***)**.



►**Note at the bottom of List #3:** — We pay *less* attention to the QT when the ECG picture is dominated by *other* findings **(***such as acute MI/bundle branch block***)**. However — IF the *only* thing wrong on the tracing is a *long* QT — *Think "Drugs/Lytes/CNS" as the cause!*

- Some of the most *bizarre* ST-T wave abnormalities (*and some of the longest QT intervals*) may be seen in association with various **CNS catastrophes (**ie, *coma, stroke, seizure, or bleed***)**. Resultant ST segment elevation that may be seen with CNS catastrophes at times may *mimic* the changes of *acute* MI.

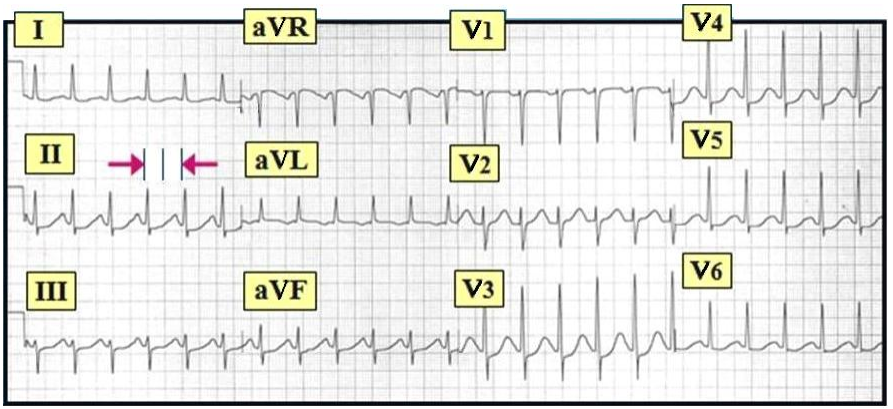
Why Care About the QT? — The answer is to hopefully prevent the rhythm below:



►**Answer:** The rhythm in the above Figure is ***Torsades* de Pointes** (*"twisting" of the points*) — so named because of *alternating polarity* of the QRS with respect to the ECG baseline. Torsades is most often associated with a ***long* QT** — with a *preceding* period of bradycardia (*a long preceding R-R interval sets up ensuing QT prolongation*). **Treatment** — Address and hopefully correct the cause of the long QT; Magnesium (*1-2gm IV, which may need to be repeated*). **Note** — Torsades ≠ VT !

REVIEW:

Tracing O — Comment on the Rate, Rhythm, and Intervals for the 12–lead ECG shown below:



►**Answer** to **Tracing O —** The Rhythm is rapid and regular. It appears that the R-R interval is approximately 2 large boxes, so that the Rate is ~150/minute. The QRS is narrow and *upright* P waves are seen in lead II with a fixed PR interval. The rhythm is therefore ***sinus* tachycardia**.

Re Intervals — *both* the PR and QRS intervals are normal. The **QT interval** is difficult to measure because of the *rapid* rate. That said — in at least several leads **(***especially leads V3-V5***)** — it looks like the QT is clearly *much more* than half the R-R interval. Thus *despite* the rapid rate — We *strongly* suspect **QT *prolongation***. List #3 helps us recall the *likely* reasons why **(**ie, *"Drugs-Lytes-CNS"***)**. Clinical correlation is needed to determine which of these may be relevant for this patient. **NOTE:** We would *not* use leads I,aVL,V1 to measure the QT **(***because we can't see the end of the QT in these leads***)**.

Bottom Line — Think ***"Drugs-Lytes-CNS"*** whenever you see a *long* QT in the *absence* of MI/ischemia/BBB.