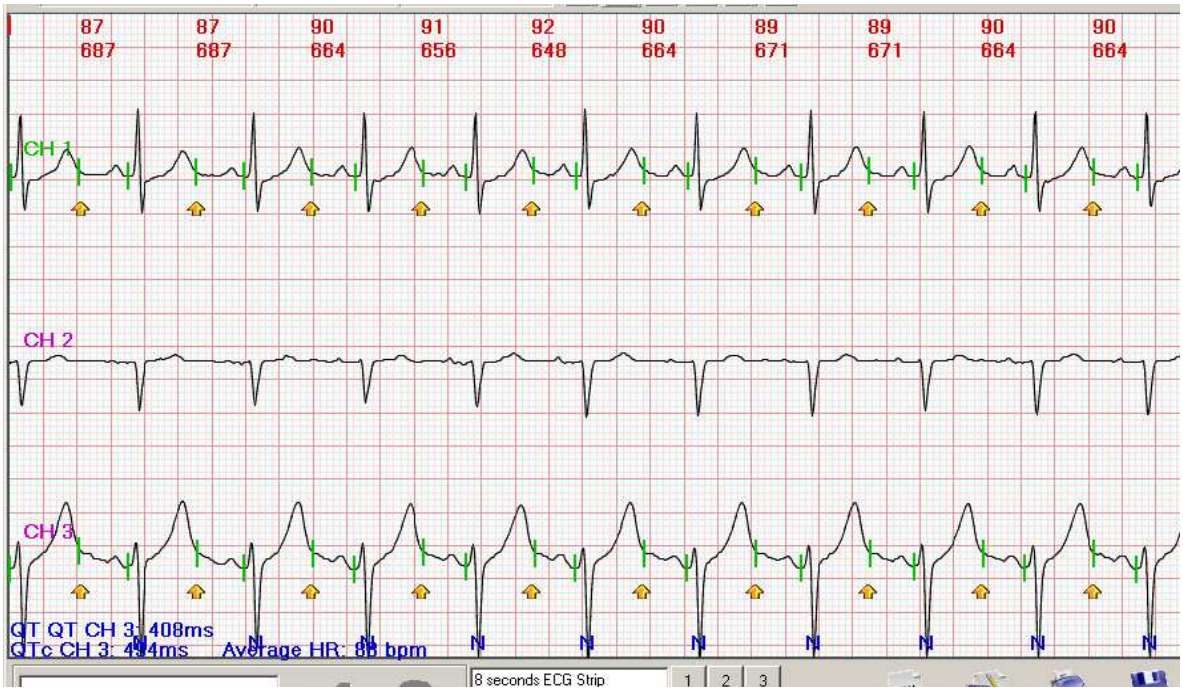
DMSoftware

CardioScan-12 Holter ECG System

Elongated QTc



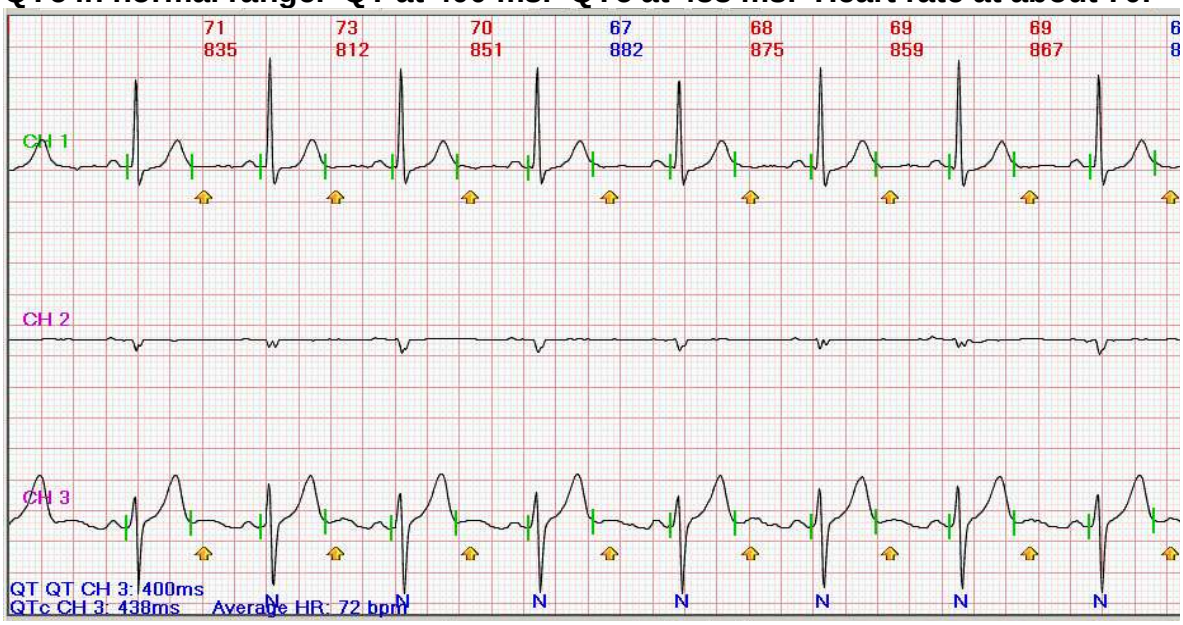
Channel 3 is the analyzed QTc lead. The heart rate is about 90 bpm (see top numbers). The QT is 408 ms (see lower left). The QTc is 494 ms (see lower left).

The QT interval is measured from (a) the right side of the green vertical marker at the beginning of Q, to (b) the left side of the green vertical marker at the end of T.

The thick yellow arrow markers at the bottom of the ECG are located at 50% of the R-R interval.

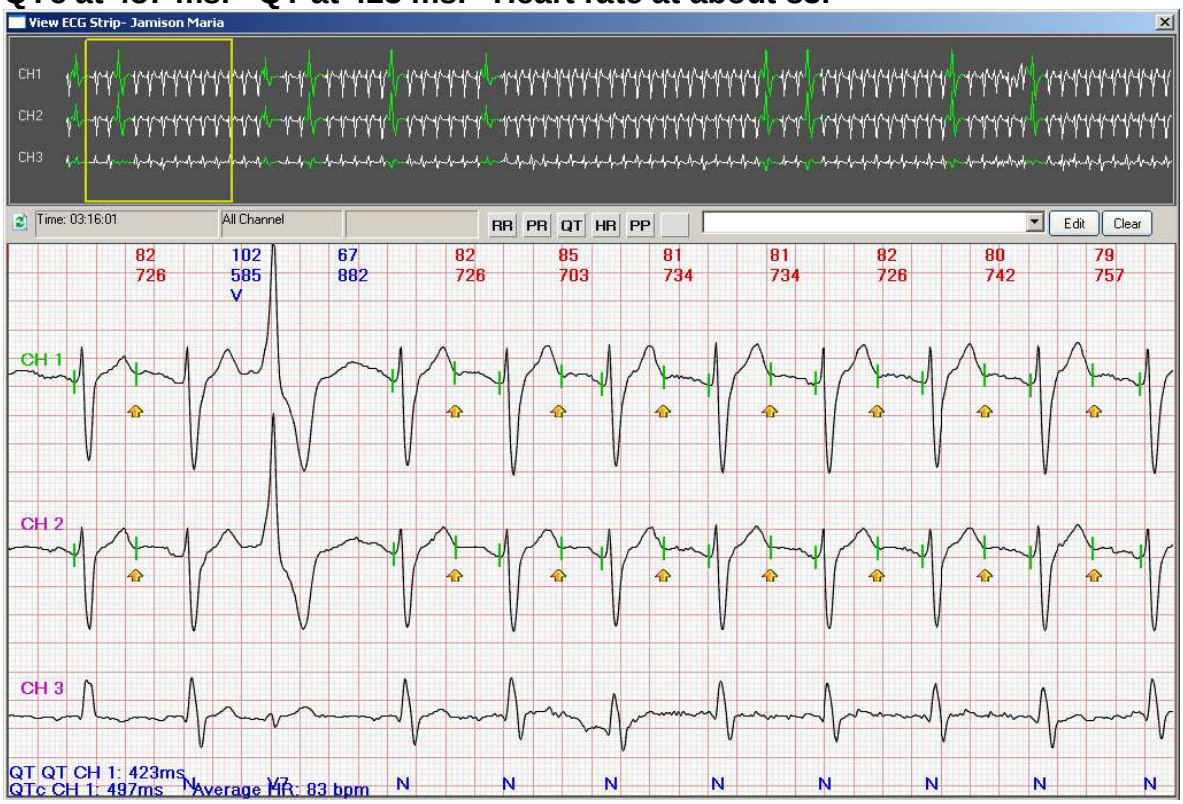
When the Holter algorithm locates a transient QTc interval of interest, a quick and user-friendly process is provided for the physician or technician to visually verify and validate the QTc measurement, Any QTc measurement can be accepted or rejected from the Holter ECG report.

QTc in normal range. QT at 400 ms. QTc at 438 ms. Heart rate at about 70.



Note that this normal QTc shows the end of T marker significantly before the yellow thick arrow, which is placed at 50% of the R-R.

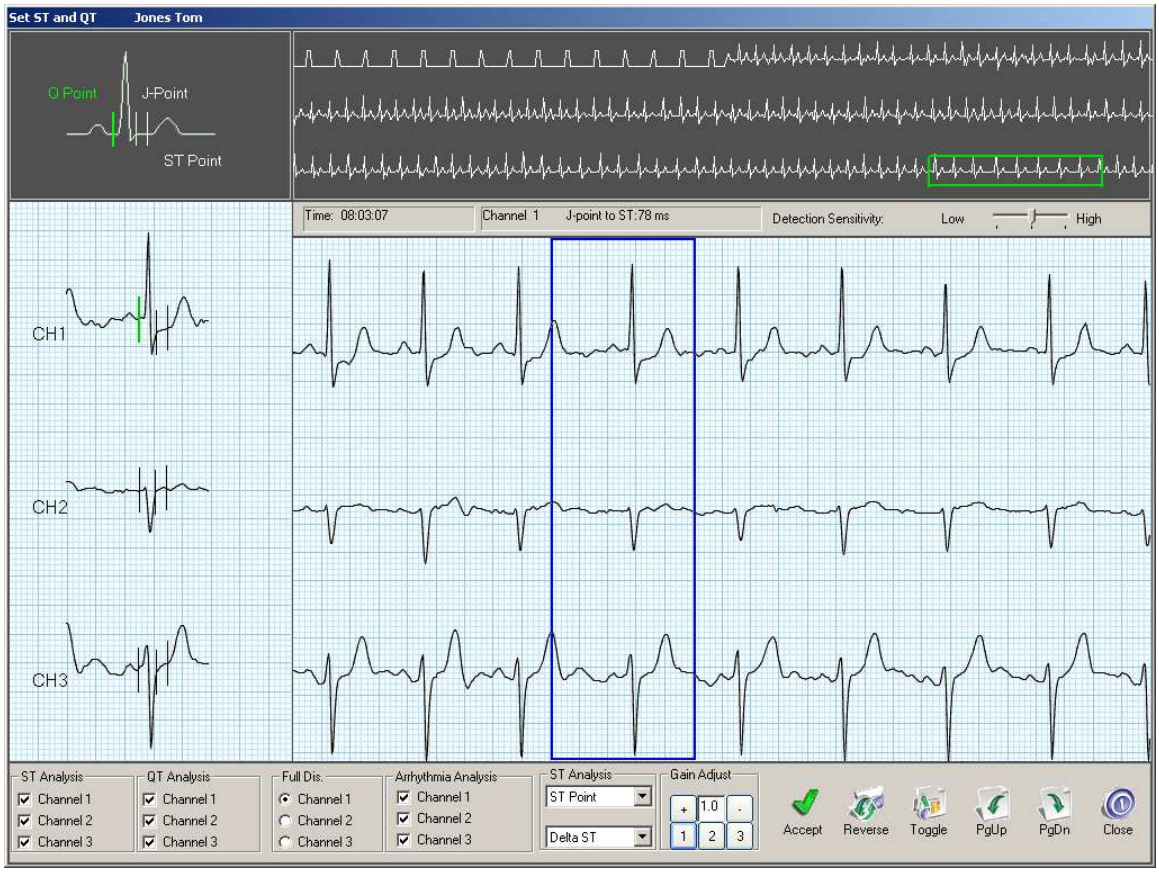
QTc at 487 ms. QT at 423 ms. Heart rate at about 83.



Arrhythmias are deleted from QT analysis. QTc is 487 ms, and end of T and 50% yellow thick arrow line up; thus, indicating a transient elongated QTc.

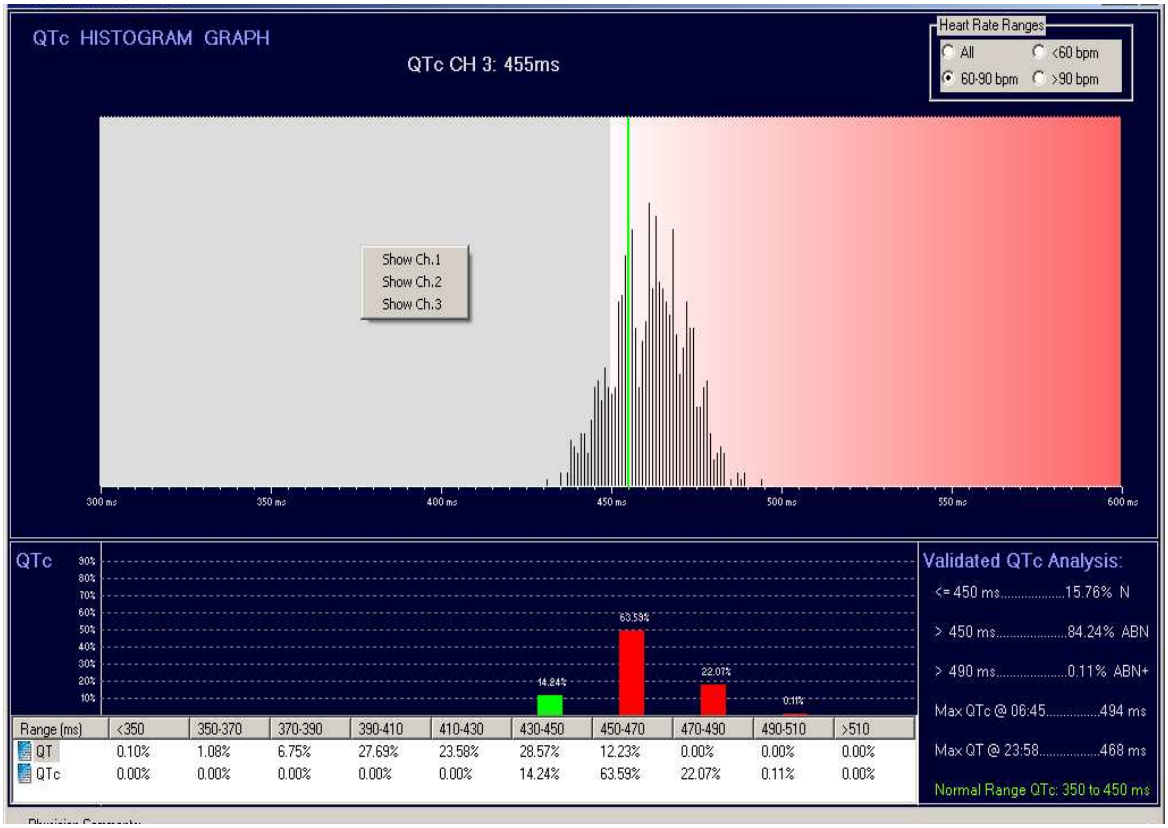
The process for using and editing the QT function.

1. In the ST-QT Set-Up menu, set the first vertical marker to the left of the beginning of Q.



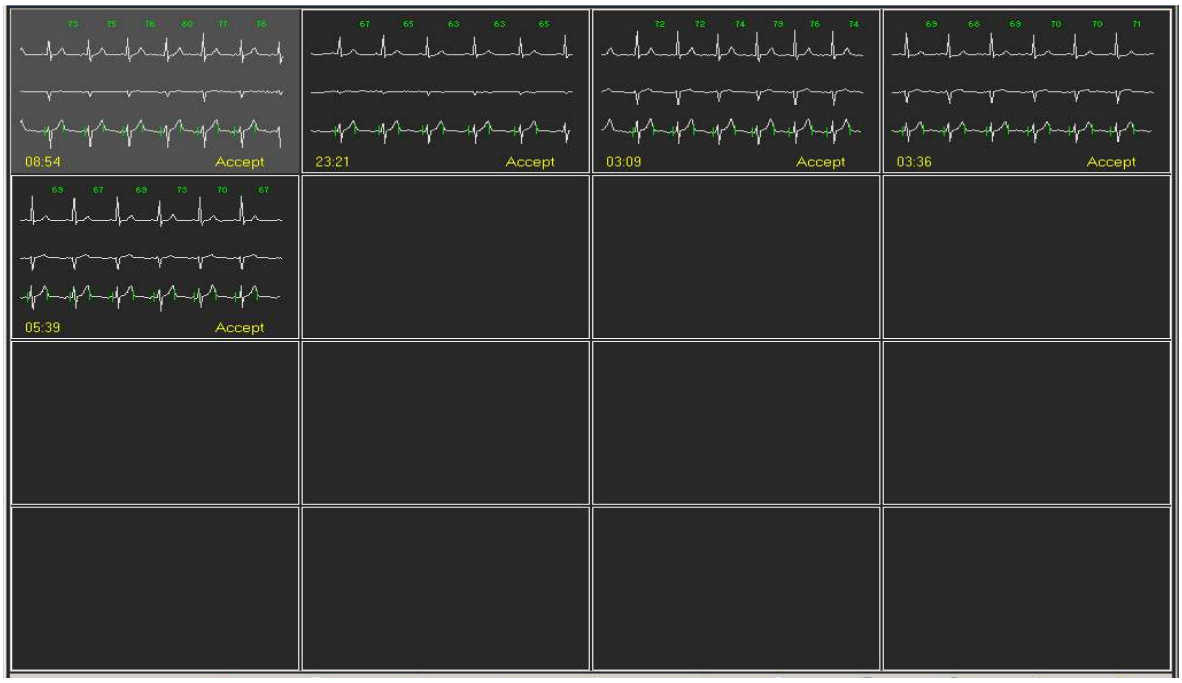
2. Quite often there is no Q-wave to visualize. However, the Q-wave is generally 40 ms in width.
3. When you move the green vertical marker to the left and right, the distance moved with each press of the left or right arrow button is 8 ms.
4. Therefore, place the first green vertical marker at the beginning of the R-wave, and then press the left arrow key for five (5) times. This is the proper location for the first green vertical marker for both ST and QT analysis.
5. This is an essential step for QT analysis.
6. Repeat this process all 3 or 12 Leads.
7. If you are interested in QT analysis for this patient, we recommend that the physician or technician first edits the QT, before editing the Arrhythmia Templates.
8. If the QT data is bad because the first green vertical marker was in the wrong location, the penalty is small. You simply “Re-Analyze” and the penalty is only about 30 seconds of time. If you first edit the Arrhythmia Templates, and then see that the QT needs a new Set-Up, you have wasted a lot of time with editing the arrhythmias.

After analysis, and a mouse click on QT Validation, the QTc histogram appears.



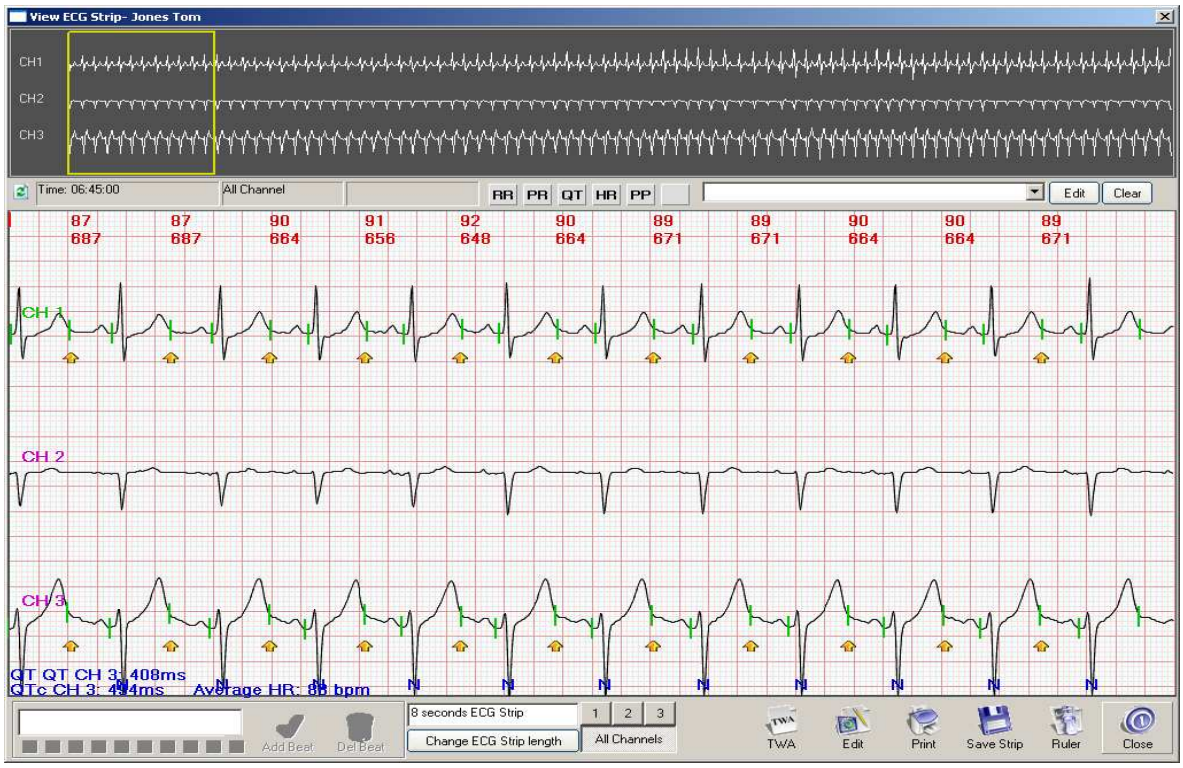
- A right mouse click allows you to select the QTc histogram for Ch. 1, 2, or 3.
- At the top right, you can select QTc analysis for Heart Rates of All, 60-90 bpm, less than 60 bpm, or more than 90 bpm.
- The long green marker in the QTc histogram can be moved by the mouse to any location in the histogram.
- The data of interest is at the far right side of the histogram
- For any analysis in Holter ECG to be valid, you always want to visually verify its accuracy. The QT/QTc is no different.
- The vertical axis of the histogram shows the quantity of QTc measurements.
- The horizontal axis shows the QTc intervals. The more elongated the QTc, the more to the right of the histogram.
- The bar graphs below the histogram show the percentages of QTc at various QTc ms ranges.
- The data at the lower right are the Max QT/QTc readings, and Percentages of QTc,
- To view the max QTc intervals, move the long green cursor to the far right of the histogram, and either double mouse click or press the Enter key.

The below screen display begins the verification and validation process.



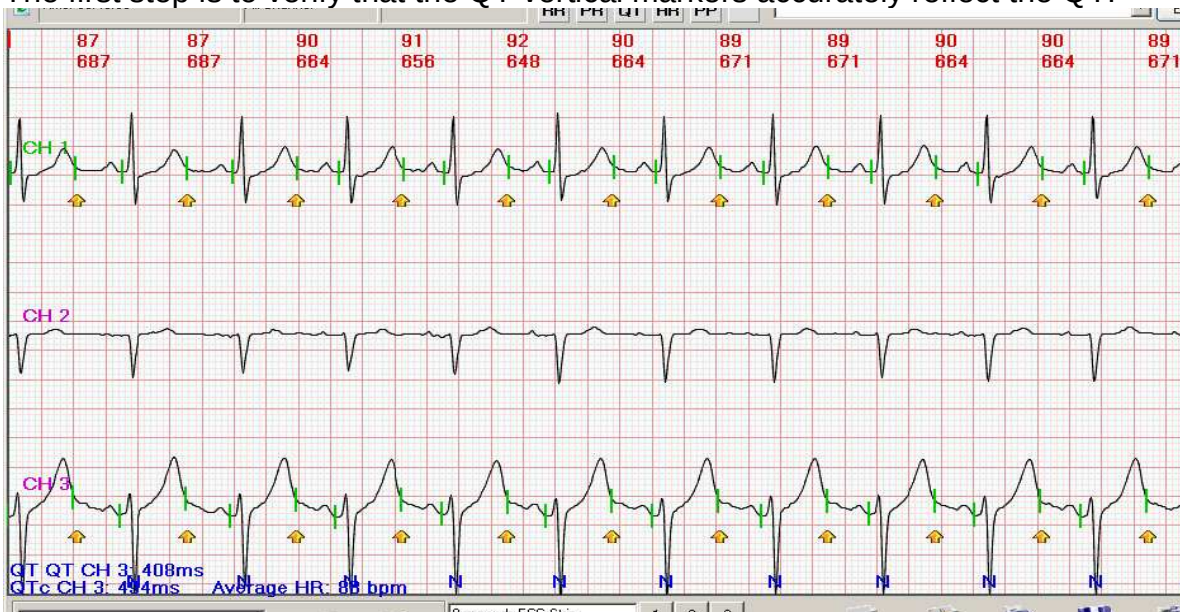
There may be several QTc's at the ms location on the QTc histogram.

Double mouse click on any desired ECG strip.

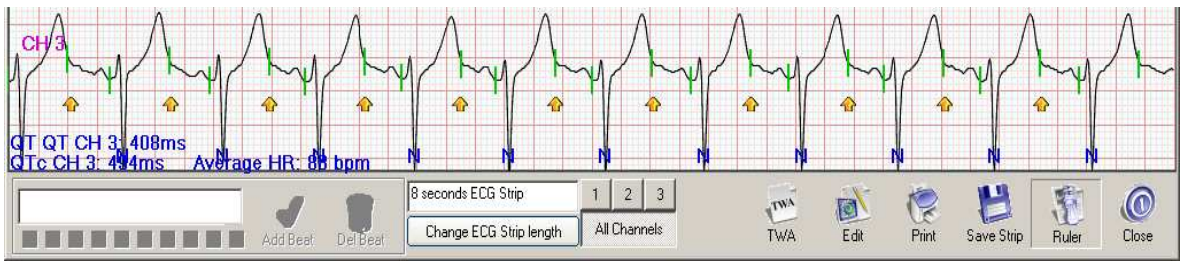


The QTc editing process is as follows.

The first step is to verify that the QT vertical markers accurately reflect the QT.

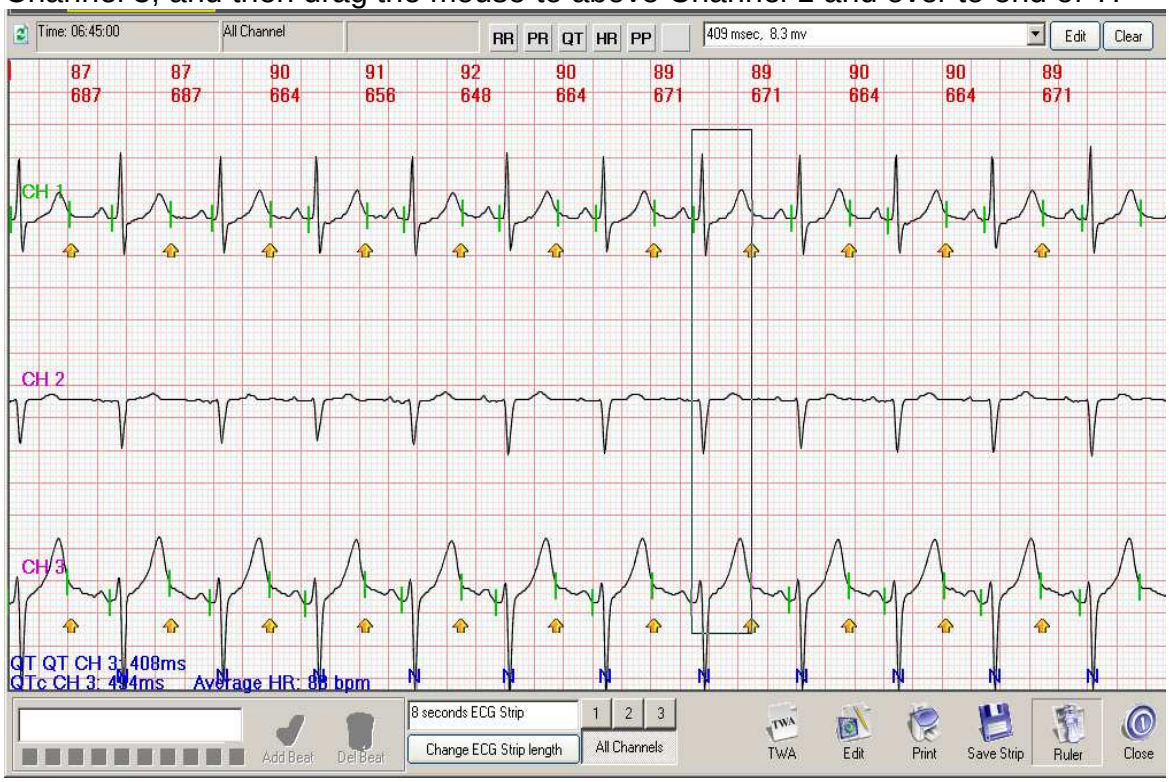


- If the QT markers are not acceptable, then reject this QTc event by ESC, followed by “R” for Reject.
- If the QT markers are acceptable, then the verification process has passed its first test.
- You can slide through this data for the entire 1-minute.
- The red Heart Rate numbers at the top of the display represent the beats from which QTc should be verified.
- You want to see acceptable QT markers for any four (4) or more successive beats with red heart rate numbers at any location in the 1-minute of data.
- The purpose of the yellow thick arrow at the bottom of the display is to provide a visual reference for the “rule-of-thumb” that a QT of 50% of the R-R interval indicates an abnormal QT interval.
- Another purpose of the yellow arrow is that the standard Bazzet formula for QTc does not perform well outside of a resting heart rate range. Holter heart rates are quite often outside the resting heart rate range. Thus, the 50% yellow arrow markers make for a good visual reference, especially when the Bazzet formula is ineffective.
- At the lower left, the QT, QTc, and average Heart Rate are shown.



To continue verification, click on Ruler icon at lower right. *

After clicking on the Ruler icon, move the cross hairs to the beginning of Q at Channel 3, and then drag the mouse to above Channel 1 and over to end of T.



Just above the electronic Ruler measurement, you see a field with the number of 409 ms. This is the QT interval measurement. Look to the lower left, and you see the computer measurement of QT on CH. 3 at 408 ms. This is verification that the computer measurement of QT at 408 ms and the corresponding QTc measurement of 494 ms are accurate.

The goal of the transient elongated QTc detection is simply to find, verify, and validate the presence of one or two abnormal QTc events. Therefore, you only need to validate one or two abnormal QTc events. This should only take one or two minutes of time.

Because of this Validation process, the DMS program for finding transient elongated QTc is believed to be the best in the industry.

Recently, serious attention has been spotlighted on the elongated QTc syndrome because of the findings that many common medications are not well-tolerated by certain patients, and the implications can be worrisome. These medications are mainly anti-arrhythmia, allergy, psychiatric, and malaria. A listing of over 100 of these medications are listed by the European Society of Cardiology, and other medical associations. A standard Holter ECG test is probably the most cost-effective method of testing for this abnormality. As stated in the textbook by

Bayes de Luna (Professor of Cardiology), “Clinically, the lengthened QT sometimes indicates a very poor prognosis.”