ECG Examples of Calculations for Derived Variables

This is the general heart rate correction formula after Fridericia:

$$QTcF = \frac{QT}{\sqrt[3]{RR}}$$

Please note:
The unit for QTcF is ms. In order to apply this formula correctly, the QT interval units have to be "ms" and the RR interval units have to be "s" (e.g. RR = 810 ms -> RR 0.81 s).

1) QTCFSMN3
QTCF, Single Mean 3 Beats

Definition: QT interval corrected for heart rate using the <u>preceding</u> RR interval by applying Fridericia's formula individually for each beat. The submission QTcF value is calculated as the mean of the three individual QTcF intervals.

Explanation: Three individual RR and three individual QT intervals were measured. The calculation is done as follows:

$$QTcF = \frac{1}{3}\sum_{3}^{i=1}\frac{QT_i}{\sqrt[3]{RR_i}} \quad \text{or} \quad QTcF = \frac{1}{3}\left(\frac{QT_1}{\sqrt[3]{RR_1}} + \frac{QT_2}{\sqrt[3]{RR_2}} + \frac{QT_3}{\sqrt[3]{RR_3}}\right)$$

Example of calculation:

Beat No	QT Interval	Preceding RR Interval	$\sqrt[3]{RR}$	$\dfrac{QT}{\sqrt[3]{RR}}$	$\dfrac{1}{3}\left(\dfrac{QT_1}{\sqrt[3]{RR_1}} + \dfrac{QT_2}{\sqrt[3]{RR_2}} + \dfrac{QT_3}{\sqrt[3]{RR_3}}\right)$
1	420 ms	0.795 s	0.926	453 ms	
2	418 ms	0.845 s	0.945	442 ms	QTCFSMN3= 447 ms
3	414 ms	0.810 s	0.932	444 ms	

2) QTCFOMN3
QTCF, Overall Mean 3 Beats

Definition: QT interval corrected for heart rate by applying Fridericia's formula using the mean RR and QT intervals measured in three selected complexes.

Explanation: Three individual RR and three individual QT intervals were measured. The calculation is done as follows

$$<QT> = \frac{1}{3}\sum_{3}^{i=1}QT_i = \frac{1}{3}(QT_1 + QT_2 + QT_3)$$

$$<RR> = \frac{1}{3}\sum_{3}^{i=1}RR_i = \frac{1}{3}(RR_1 + RR_2 + RR_3)$$

$$QTcF = \frac{<QT>}{\sqrt[3]{<RR>}}$$

Example of calculation:

Beat No	QT Interval	Preceding RR Interval	$< QT >$	$< RR >$	$\dfrac{< QT >}{\sqrt[3]{< RR >}}$
1	420 ms	0.795 s			
2	418 ms	0.845 s	417 ms	0.817 s	QTCFOMN3= 446 ms
3	414 ms	0.810 s			

3) QTCFGMN1
QTCF, Overall Mean One Beat

Definition: QT interval corrected for heart rate by applying Fridericia's formula using the mean RR interval measured in all dominant beats and a single QT interval determined based on the superimposed median beat method.

Explanation: RR intervals are measured in all dominant beats (n = number of dominant beats in the ECG). QT is measured from the global median beat (a constructed median ECG complex utilizing all leads and dominant complexes). The calculation is done as follows

$$< RR >= \frac{1}{n}\sum_{n}^{i=1} RR_i = \frac{1}{n}(RR_1 + RR_2 + ... + RR_n)$$

$$QTcF = \frac{QT}{\sqrt[3]{< RR >}}$$

Note: This is the formula most standard 12 lead ECG machines use.