QT interval

The QT interval is a specific measurement on an electrocardiogram (ECG or EKG) that represents the duration of time it takes for the ventricles of the heart to depolarize (contract) and then repolarize (reset) during a single heartbeat. It is an important parameter in cardiology because abnormalities in the QT interval can be associated with various cardiac conditions and arrhythmias.

Here are some key points about the QT interval:

Measurement: The QT interval is measured from the beginning of the QRS complex (which represents ventricular depolarization) to the end of the T wave (which represents ventricular repolarization) on an ECG. It is usually measured in milliseconds (ms).

Normal Duration: The normal QT interval duration varies with heart rate, so a corrected QT interval (QTc) is often used for a standardized measurement. At a heart rate of around 60-100 beats per minute, a typical QTc interval is between 350 and 440 ms. However, there may be slight variations depending on the method used to calculate the QTc.

Significance: The QT interval is important because it reflects the time it takes for the heart's electrical system to reset itself for the next heartbeat. If the QT interval is significantly prolonged or shortened, it can increase the risk of arrhythmias, particularly a type of arrhythmia called Torsades de Pointes, which can be life-threatening.

Factors Affecting QT Interval: Several factors can influence the duration of the QT interval, including heart rate, medications (some can prolong it), electrolyte imbalances (low potassium or magnesium levels can prolong it), and certain medical conditions (such as congenital long QT syndrome).

Clinical Significance: A prolonged QT interval can be associated with conditions like Long QT Syndrome, electrolyte imbalances, heart disease, or the use of medications that affect cardiac repolarization. It is important to identify and manage the underlying cause of a prolonged QT interval to reduce the risk of arrhythmias.

Monitoring: Monitoring the QT interval is essential when prescribing medications known to affect it, as well as for patients with known cardiac conditions or risk factors. Baseline ECG measurements and periodic follow-up ECGs may be recommended.

Treatment: The treatment for a prolonged QT interval depends on the underlying cause. This may include discontinuing medications that prolong the QT interval, correcting electrolyte imbalances, or addressing underlying cardiac conditions. In some cases, beta-blockers or other medications may be prescribed to reduce the risk of arrhythmias.

It's important to note that interpreting the QT interval on an ECG requires expertise, and clinical judgment is essential to assess the significance of any abnormalities.

QT interval in Neurosurgery

- Different Causes of a Transient loss of Consciousness with Convulsions between Two Young Sisters: Epilepsy and Type-2 Long QT Syndrome
- The effect of transcutaneous auricular vagus nerve stimulation on cardiovascular function in

subarachnoid hemorrhage patients: A randomized trial
- Stellate Ganglion Block for Electrical Storm Associated With Takotsubo Cardiomyopathy: A Case Report
- Management of Long QT Syndrome: A Systematic Review
- QTc prolongation after aneurysmal subarachnoid hemorrhage might be associated with worse neurologic outcome in patients receiving microsurgical clipping or embolization of the intracranial aneurysms: a retrospective observational study
- Intensive Ambulance-Delivered Blood-Pressure Reduction in Hyperacute Stroke
- The effect of transcutaneous auricular vagus nerve stimulation on cardiovascular function in subarachnoid hemorrhage patients: a safety study
- Left cardiac sympathetic denervation in children with Jervell Lange-Nielsen syndrome and drug refractory torsades - A case series

Prolonged QTc is frequently observed after a brain surgery. Hypokalemia, hypocalcemia, and drugs such as metoclopramide or phenytoin could not explain the high incidence of prolonged QTc. Brain injury during a surgical procedure may be one of the primary causes of QTc prolongation after neurosurgery [1)]

Findings suggest that female sex and hypokalemia are independent risk factors for severe QTc prolongation in patients with SAH [2)]

Cerebral contusion (CC) results in a release of catecholamines, autonomic dysfunction, and neural stimulation that can lead to a number of cardiac adverse events, so it is critical to determine these. ECG changes on admission showing a prolonged corrected QT interval have prognostic significance in CC. This simple and easily applicable information should be taken into consideration at the time of clinical decision making which may prevent an adverse events survivor [3)]

As the intensive anti-tumor therapy and combination of multiple anti-tumor drugs, cardiotoxicity events caused by anti-tumor drugs have also increased significantly, and the incidence of cardiotoxicity also increased with survival time. Different types of anti-tumor drugs could cause all kinds of cardiotoxicity which increases the difficulties in treatment and even life-threatening. In this review, we concentrated on the targeted anti-tumor drugs such as human epidermal growth factor receptor-2 (HER2) inhibitors, tyrosine kinase inhibitors (TKIs), immune checkpoint inhibitors (ICIs), and proteasome inhibitors (PIs). The molecular mechanism of how these drugs induce cardiotoxicity is introduced which includes several signal pathways. These drugs induced cardiotoxicity involved heart failure, hypertension, atherosis and thrombosis, QT interval prolongation, and myocarditis [4)]

1)
Capparelli FJ, Abello M, Patricio Maskin L, Arista E, Hlavnicka A, Diaz MF, Varela D, Wainsztein NA. QTc prolongation after brain surgery. Neurol Res. 2013 Mar;35(2):159-62. doi: 10.1179/1743132813Y.0000000169. PMID: 23452578.
2)
Fukui S, Katoh H, Tsuzuki N, Ishihara S, Otani N, Ooigawa H, Toyooka T, Ohnuki A, Miyazawa T, Nawashiro H, Shima K. Multivariate analysis of risk factors for QT prolongation following subarachnoid hemorrhage. Crit Care. 2003 Jun;7(3):R7-R12. doi: 10.1186/cc2160. Epub 2003 Feb 21. PMID: 12793884; PMCID: PMC270671.

3)
Yavuz AY, Baskurt O, Kurtulus Y, Avci I. Prognostic significance of prolonged corrected QT interval in cerebral contusion. Indian J Med Res. 2023 Sep 14. doi: 10.4103/ijmr.ijmr_3629_21. Epub ahead of print. PMID: 37706372.
4)
Zhang X, Gao Y, Yang B, Ma S, Zuo W, Wei J. The mechanism and treatment of targeted anti-tumour drugs induced cardiotoxicity. Int Immunopharmacol. 2023 Apr;117:109895. doi: 10.1016/j.intimp.2023.109895. Epub 2023 Feb 18. PMID: 36806040.