



Blue Ridge Poison Center's

Tox Talks

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Treatment of QT Prolongation

DOES YOUR FACILITY HAVE TELEMEDICINE?

The Blue Ridge Poison Control Center offers CME-accredited toxicology lectures through telemedicine. To request a topic, schedule a lecture for your staff, or more information contact Heather Collier: 434-924-5185 or HLC8E@virginia.edu.

THE UVA CENTER OF CLINICAL

TOXICOLOGY associated with the Blue Ridge Poison Center manages over 500 patients each year on site in the University of Virginia Health System - from outpatient clinic visits to critically ill inpatients managed in our pediatric and adult intensive care units. In addition, over 2,000 requests are made each year for consultation with our physicians from other healthcare facilities by phone or telemedicine. Our Boarded Medical Toxicologists are internationally known for the expertise in the care of poisoned patients. Call 1-800-222-1222 24 hours a day, every day. [Cell users: 1-800-451-1428]

<http://www.healthsystem.virginia.edu/internet/medtox/cct/ccthome.cfm>

IN CHARLOTTESVILLE

Reminder: At University of Virginia Hospital, the first Wednesday of every month features toxicology Grand Rounds. For more information, contact Heather Collier: 434-924-5185 or HLC8E@virginia.edu

With the increasing prevalence of medications that prolong the QT interval, knowledge of this syndrome and potential treatment options is essential. The QT interval prolonging effects of predisposing medications may be seen in therapeutic dosing, but may be more pronounced when two or more of these medications are prescribed concomitantly or when taken in acute overdose. The primary risk of QT prolongation is that it predisposes the patient to the ventricular dysrhythmia Torsades de Pointes (TdP). Treatment consists of implementing measures to stabilize the myocardium to prevent this reentrant rhythm.

QT interval prolongation may be either congenital or acquired. Acquired QT prolongation may be obtained by several different mechanisms. Medications/toxins and electrolyte imbalances are the two most common means; however, myocardial infarction, cerebral vascular accidents, hypothyroidism, and hypothermia have also been reported to cause QT prolongation. Medication induced QT prolongation is most commonly generated by potassium efflux channel blockade. Extensive lists of these medications can be found at multiple websites including: <http://www.qtdrugs.org>. Normal QTc intervals are less than 440 msec in men and less than 460 msec in women. QTc intervals greater than 500 msec appear to correspond with an increasing risk of dysrhythmia, however, recent studies have suggested that intra-myocardial variations in repolarization may be more important in the production of TdP than actual length of QT interval.

Intravenous magnesium sulfate is considered the first line therapy for both the prevention and treatment of medication-induced TdP. Magnesium appears to stabilize the myocardium by suppressing aberrant depolarization, although heart rate and the QT interval on ECG are not expected to change after administration. Typically dosing for stable patients with QTc intervals greater than 500 msec after a known or possible toxic ingestion is 2 gms magnesium sulfate IV in adults (25-50 mg/kg

up to 2 gms in children). It is reasonable to repeat this dose every six hours if the QTc remains above 500msec.

In the treatment of TdP, 2 gms of magnesium sulfate in adults (25-50 mg/kg up to 2 gms in children) is given IV over 60 seconds. This dose may be repeated in 5-15 minutes for refractory dysrhythmias. Continuous infusion of up to 3-10 mg/min in adults may also be started for persistently refractory dysrhythmias. One small study demonstrated the optimum continuous infusion rate in children to be 0.5-1.0 mg/kg per hour. Following repeated infusions, clinicians should monitor for magnesium toxicity may, signified by hyporeflexia, central nervous system depression, respiratory depression and hypotension. Repletion of potassium and calcium is also essential when either hypokalemia or hypocalcemia is present as either of these electrolyte abnormalities may contribute to the dysrhythmia.

Refractory TdP may be amenable to cardiac pacing, either chemical or electrical. Patients with cardiovascular collapse must be treated with direct-current cardioversion and standard resuscitation protocols. Transcutaneous cardiac pacing can be initiated as a temporary treatment of TdP, but transvenous pacing is the preferred method of pacing as the incidence of cardiac capture is higher and sedation is generally not necessary. Transvenous pacing is also preferable over chemical pacing as electrical means carry less risk in patients with congenital long QT syndrome (LQTS). After ventricular capture, the ventricular rate should be adjusted to suppress ectopic ventricular beats. Using an asynchronous (fixed rate) mode, ventricular rates of 90-140 bpm are usually sufficient to eliminate ventricular ectopy. Once control of the dysrhythmia has been obtained, the pacing rate can be gradually diminished to the lowest paced rate that adequately suppresses further ectopy and dysrhythmia.

Isoproterenol is a non-selective beta adrenergic agonist agent that has classically been used for overdrive pacing. Beta-1 adrenergic receptors function to increase inotropy and chronotropy in the heart while beta-2 adrenergic receptors cause peripheral vasodilation. For refractory TdP, initial dosing of isoproterenol is 0.5-1.0 mcg/min in an adult and 0.1 mcg/kg/min in a child. Upper limit of dosing is 20 mcg/min in the adult and 1.5 mcg/kg/min in a child. The endpoint of treatment is similar to that of mechanical cardiac pacing: suppression of ectopic ventricular beats and TdP. Doses of 2-10 mcg/min are typically sufficient to raise the HR above 90 bpm to begin appropriate overdrive. Following suppression of dysrhythmia the infusion can be titrated to a rate that adequately suppresses aberrant rhythms. Palpitations are a common complaint during use which may decrease patient tolerance. Use of isoproterenol increases cardiac demand, so caution should be used in patients with preexisting cardiovascular disease. Isoproterenol may also increase the risk of dysrhythmia in patients with congenital LQTS and, therefore, should be reserved for those patients with acquired LQTS.

As the use of QT prolonging drugs is on the rise, the number of patient's presenting with TdP is likely to increase. Clinicians should be aware of this disease and the appropriate therapy.

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