CONGENITAL LONG QT SYNDROME (CLQTS) ASSOCIATED WITH COMPLETE ATRIOVENTRICULAR BLOCK. A CASE REPORT.

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Congenital Long QT syndrome (cLQTS) can be defined as a group of cardiac ion channel abnormalities, which are a result of mutations in the genes encoding for them.

It is a familial cardiovascular disorder characterized by abnormal cardiac repolarization seen as prolonged corrected QT interval on the surface ECG. It is associated with torsades des pointes and sudden cardiac death (SCD).
• The European Task Force on Neonatal Electrocardiography defines a prolonged QT as more than 470ms.

• Complete atrio-ventricular block is defined as complete AV dissociation on ECG.

• The most common AV block associated with congenital LQTS is a functional 2:1 block.

• Congenital LQTS with complete AV block is a rare condition that carries a poor prognosis with high risk for SCD in infancy.
A term infant presenting with a respiratory tract infection at the age of 27 days, was found to be bradycardic.

He was born by normal vaginal delivery, with a birth weight of 3.4 kg, with no significant maternal medical or drug history. There was no family history of sudden cardiac death, syncope, deafness or drowning.
On examination, he was pink, in respiratory distress with no dysmorphisms. Cardiovascular examination was normal apart from the bradycardia.

The ecg showed complete AV block with a narrow complex, junctional ventricular escape rhythm (50bpm). The QTc was prolonged (560ms).
Age not entered, assumed to be 50 years old for purpose of ECG interpretation

AV block, complete (third degree)

Right axis deviation

Consider left ventricular hypertrophy

Abnormal T, probable ischemia, widespread

Prolonged QT interval

---AXIS---

QRS 110

T 223

12 Lead; Standard Placement

Unconfirmed Diagnosis

Device: Speed: 25 mm/sec  Limb: 10 mm/mV  Chest: 10.0 mm/mV

PHILIPS
Our patient's Schwartz diagnostic criteria score was 3.5, indicating a high probability of LQTS.
Echocardiography revealed a structurally normal heart. U&E and thyroid function.

Both parents had a normal ECG.

A dual chamber epicardial pacemaker (Ensura DR MRI EN 1DR01) was inserted. Programmed to DDD pacing.

Our patient was initiated on propranolol at 3mg/kg/day.

The results of genetic testing are still awaited.
PACING
ECG
DISCUSSION

• Prevalence of cLQTS thought to be 1/5000 to 1/20000

• Congenital long QT syndrome initially, identified the following two syndromes Romano ward, which is characterized by syncopal episodes and ecg abnormalities.
DISCUSSION

• Jervell and Lange Nielsen syndrome a recessive type of long qt syndrome which may have 2 homozygous or compound heterozygous mutations of KCNQ1 or KCNE1 gene. These patients also suffer from congenital deafness.

• Molecular testing identifying the mutations associated with the channelopathies has allowed for a much broader classification of CLQTS.
• cLQTS1 is due to mutations of the KCNQ1 gene and the gene which encodes for the α subunits of the K channels. 45% prevalence.

• cLQTS2 is the result of a mutation in the HERG (KCNH2) which also encodes for a potassium channel subunit. 45% prevalence.
cLQT3 is due to a mutation in the SCN5A gene producing a mutated sodium channel subunit which result in an increase in the sodium inward current increasing the duration of the action potential. 5% prevalence.

Combined these make up to 75% of the LQTS

Although events in cLQT1 and cLQT2 events are more frequent, cLQT3 events are commonly lethal especially in the neonatal population.
• Though we have discussed
• CLQTS in the above.
• There are many sub types as
• shown.

<table>
<thead>
<tr>
<th></th>
<th>Chromosome</th>
<th>Gene</th>
<th>Ion current affected</th>
<th>Relative frequency in genotyped</th>
<th>Phenotype triggers</th>
<th>Phenotype ECG</th>
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</thead>
<tbody>
<tr>
<td>LQTS 1</td>
<td>11p15.5</td>
<td>KCNQ1 (KVLQT1)</td>
<td>Potassium</td>
<td>~45%</td>
<td>Activity, emotions</td>
<td>Smooth, broad-based T waves</td>
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<tr>
<td>LQTS 2</td>
<td>7q35-36</td>
<td>HERG</td>
<td>Potassium</td>
<td>~45%</td>
<td>Emotions, auditory, activity</td>
<td>Notched low-amplitude T waves</td>
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<tr>
<td>LQTS 3</td>
<td>3p21-24</td>
<td>SCN5A</td>
<td>Sodium</td>
<td>~5%</td>
<td>Sleep</td>
<td>Late onset of T wave</td>
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<td>LQTS 4*</td>
<td>4q25-27</td>
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<td>Unknown</td>
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<td>LQTS 5</td>
<td>21q22</td>
<td>KCNE1</td>
<td>Potassium</td>
<td>~2%</td>
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<tr>
<td>LQTS 6</td>
<td>21q22</td>
<td>KCNE2</td>
<td>Potassium</td>
<td>~2%</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

* The gene product for LQTS 4 has not yet been identified.
• Management:

• The first choice of management in patients with LQTS is Beta adrenergic blockade. Propranolol is the most widely used drug and reduces mortality to 0.5%. (Nadolol).

• Left cardiac sympathetic denervation is offered in those patients who are still symptomatic despite full dose Beta blockade. Results in a 90% reduction in cardiac events. Post surgical QTc <500ms.
DISCUSSION.

• Cardiac Pacing: In children with 2:1 block, it is reasonable to pace. Commonly but not always, their Torsades des pointes is preceded by a pause. The addition of Beta blocker in the presence of complete heart block and long QT makes it more likely for the child to develop Torsades.

• The longer the QTc the higher the risk of developing torsades in the neonatal population

• Implantable Cardioverter defibrillator: The risk of developing an electrical storm precludes the routine installation of ICDs. However, after cardiac arrest ICD should be implanted.
• Novel therapies.
  
• In 1995 Schwartz and Priori reported the use of gene specific therapy by using the antiarrhythmic drug mexiletine, a sodium channel blocker in patients with identified SCN5A mutations i.e. LQT3.

• The use of Video Assisted Thoracoscopic Left sympathectomy is explored by Li JF et al and is shown to be effective in LCSD.

• Lastly, Li G et al in their 2015 article delve into the use of RNA interference in suppressing or silencing the expression of mutant genes.
• CLQTS was initially a potentially fatal disease of the ionic channels.
• The information and experience that is available indicates that treatment should always begin with beta blockers.
• The decision to pursue LCSD or Pacing should be patient based.
• Awareness around LQTS should be raised.
• As more technological advances in genetic testing arise. The near future may dictate earlier diagnosis of LQTS before the patient is even symptomatic.
REFERENCES

11. Ziki A, Seidelmann S. B. Deleterious protein-altering mutations in the SCN10A voltage gated sodium channel gene are associated with prolonged QT. Medline 2017