

CONGENITAL LONG QT SYNDROME WITH FUNCTIONALLY IMPAIRED ATRIOVENTRICULAR CONDUCTION: SUCCESSFUL TREATMENT BY MEXILETINE AND PROPRANOLOL

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Abstract: Congenital long QT syndrome (LQTS) with atrioventricular block is a rare and malignant arrhythmia, which usually responds poorly to traditional β -blocker therapy. We describe a male neonate with LQTS with ventricular tachycardia and 2:1 atrioventricular block. This patient's sister had similar presentation and died suddenly at the age of 8 months despite β -blocker and pacemaker therapy. Our patient responded to a combination of sodium channel blocker (mexiletine) and β -blocker (propranolol) therapy. He was asymptomatic during a 2-year follow-up period. This case suggests that propranolol combined with mexiletine might be useful in the treatment of patients with LQTS with atrioventricular block.

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Key words:
long QT syndrome
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Congenital long QT syndrome (LQTS) is a genetic disorder characterized by prolongation of the QT interval and polymorphic non-sustained ventricular tachycardias, known as torsades de points, which lead to syncope and even sudden death [1]. LQTS associated with atrioventricular (AV) block usually occurs sporadically at a very young age, and carries a poor prognosis [2-7]. We report a case of congenital LQTS associated with 2:1 AV block that was successfully treated with propranolol and mexiletine.

Case Report

A male baby, born at 36 weeks of gestation with a body weight of 2,890 g, was transferred to our hospital due to bradycardia. He had a strong family history of LQTS that manifested with sudden death or syncope (Fig. 1). His elder sister was noted to have bradycardia alternating with AV block and tachycardia from the 26th week of gestation. LQTS with intermittent AV block was diagnosed after birth. She died suddenly at the age of 8 months despite propranolol and pacemaker therapy.

On admission, this neonate was well in general appearance and without congenital abnormalities. His surface elec-

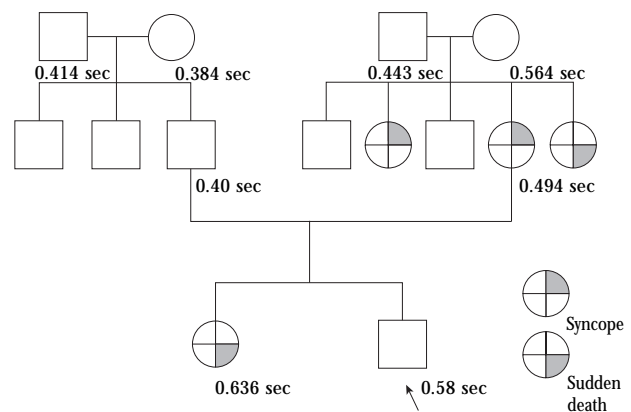


Fig. 1. Family hereditary chart. Two members died suddenly, two had syncopal episodes, and four had prolonged QT interval. The corrected QT interval is given only for the baby (arrow) and key persons.

trocardiogram (ECG) showed a prolonged QT interval (QTc: 0.58 s) with early onset broad-based T wave (Fig. 2A). On Day 3, continuous rhythm monitoring revealed occasional 2:1 AV conduction with narrow QRS complex (Fig. 2B), which spontaneously converted into 1:1 AV conduction with progressively increasing T wave amplitude (Fig. 2C), and then a burst attack of torsade de points occurred (Fig. 2D). There was

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occasional right bundle branch conduction block and sinus bradycardia in his ECG tracings (Fig. 2E). He was treated with intravenous propranolol (0.1 mg/kg every 8 hr) but did not respond, so xylocaine infusion ($30 \mu\text{g}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) was added which successfully shortened the QT interval (QTc: 0.48 s), and there were no further episodes of torsade de points or AV block. He was discharged with a prescription of propranolol ($3 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$) and mexiletine ($9 \text{ mg}\cdot\text{kg}^{-1}\cdot\text{d}^{-1}$). He was asymptomatic during a 2-year follow-up. Neither torsade de points nor AV block were observed on repeated ECGs and 24-hour Holter monitoring. The QTc was 0.43 to 0.48 seconds.

Discussion

Due to a markedly prolonged ventricular effective refractory period, patients with congenital LQTS can also have variable degrees of functional AV conduction block (usually 2:1 block) or intraventricular conduction delay [3]. In this group of patients, the clinical presentations are different from those in patients with congenital LQTS only, including markedly prolonged QT interval, younger age onset, and poor response to traditional therapies [2–7].

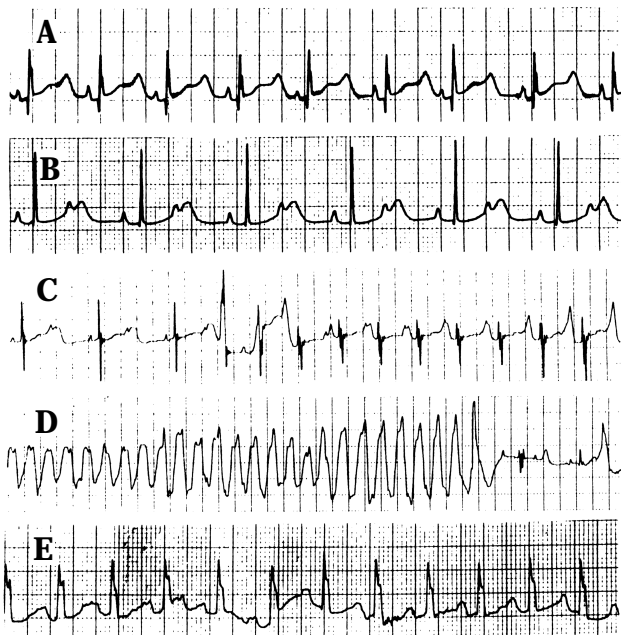


Fig. 2. Rhythm strip lead II. A) Sinus rhythm with 1:1 atrioventricular conduction and a prolonged QT interval (QTc: 0.58 s) with early onset broad-based T wave. B) Sinus rhythm with 2:1 atrioventricular conduction. C) Peculiar T-wave changes noted with transition from 2:1 to 1:1 atrioventricular conduction. D) Non-sustained polymorphic ventricular tachycardia with spontaneous conversion. E) Right bundle branch conduction block.

Traditionally, β -blocker therapy remains the first-line treatment for patients with LQTS. For patients with LQTS and bradycardia, combined therapy with a β -blocker and pacemaker is recommended [1, 8]. Both our patient and his sister had similar clinical presentations in the perinatal period. They both failed to respond to β -blocker therapy. His sister died in infancy despite a pacemaker implantation. Thus, the standard treatment for LQTS in this patient and his sister was not effective.

LQTS is caused by cardiac ion channel defects [8]. Different cardiac ion channel mutations can cause different subtypes [8]. Thus, the management of LQTS might be modified based on the specific gene mutation identified. Mexiletine, a sodium channel blocker, not only shortens the action potential duration of M cells but can also reduce the transmural dispersion of the ventricular repolarization. These effects, in turn, can prevent the development and induction of torsade de points [9]. Experimental study has shown that mexiletine can abbreviate the QT interval in all patients with LQT3 (sodium ion channel defect) but in fewer than 10% of patients with LQT1 or LQT2 (potassium channel defect) [10, 11]. Although we did not perform a genetic study, a diagnosis of type 1 LQTS was suggested by the ECG pattern of early onset broad-based T waves in the patient and his family members [12]. Mexiletine might possess some adjunctive effects in shortening the QT interval and preventing the cardiac arrhythmias in such cases.

LQTS with functional 2:1 AV block has a grave prognosis and more than half of patients die in infancy and early childhood despite the use of different modes of treatment such as beta blockade, pacemaker implantation, and left ganglion stlectomy [2–7]. This case suggests that, if xylocaine infusion can shorten the QTc interval for patients presenting with LQTS and AV block, then propranolol combined with mexiletine might be an alternative outpatient therapy.

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