

# Jervell and Lange-Nielson Syndrome masquerading as intractable epilepsy

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## Abstract

The long QT syndrome (LQTS) is a cause of syncope and sudden death. Jervell and Lange-Nielson syndrome (JLNS) is an uncommon form of LQTS, having autosomal recessive transmission, and is associated with congenital deafness. We report a case of JLNS in a child who presented to us with refractory epilepsy. The cardiac cause of seizures was suspected as the child was hypotensive and pulseless during the episode of seizures. The child was diagnosed as JLNS based on Schwartz diagnostic criteria for LQTS and congenital sensorineural deafness. The child responded well to  $\beta$ -blocker therapy. Antiepileptic drugs were stopped. The screening of family members with ECG revealed a QT interval more than required for diagnosis of LQTS but they were asymptomatic. All asymptomatic family members were also put on metoprolol. All of them showed great improvement with the reduction of the QT interval on ECG. The patient was doing well on immediate follow-up.

## Key Words

Long QT syndrome, Jervell and Lange-Nielsen syndrome, seizures

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## Introduction

The long QT syndrome (LQTS) is a genetic abnormality of ventricular repolarization. It may sometime present as epilepsy.<sup>[1,2]</sup> It is a cause of syncope and sudden death. Jervell and Lange-Nielson Syndrome (JLNS) is an uncommon form of LQTS, having autosomal recessive transmission, and is associated with congenital deafness.<sup>[3]</sup> We report a case of JLNS who presented with refractory epilepsy.

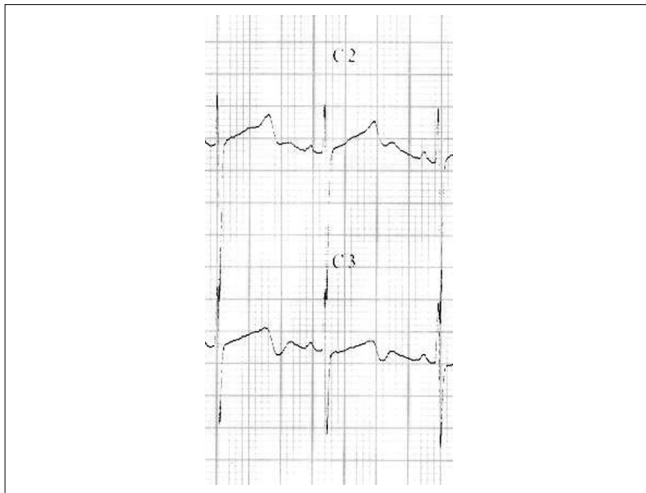
## Case Report

A 5-year-old child was referred to our institute with the history of recurrent seizures since the age of 2 years. During the last 18 months, he was having almost two episodes of seizures per month while on the maximum dose of valproate and clobazam. The frequency of convulsions increased in the last 3 days. He had four episodes of seizures in the last 1 day. The convulsion was brief; a generalized tonic-clonic seizure with perspiration

and palpitation usually preceded the convulsion. He was born of first-degree consanguineous marriage and was deaf and mute since birth. There was no family history of convulsion and sudden cardiac death. On examination, he had mild pallor; his pulse rate was regular at 100/min. The blood pressure was 84/60 mm of mercury in the right arm in the sitting position. His clinical examination was unremarkable.

On arrival to our institute with presumptive diagnosis of intractable epilepsy, he was given intravenous phenytoin in a loading dose of 20 mg/kg/day, valproate 60 mg/kg/day, and midazolam infusion 0.1 mg/kg/h. The child had four episodes of seizures in a 6-h period during our hospital stay. The child was hypotensive and pulseless during the episodes of convulsions. An ECG was done after the episodes of convulsions which showed QTc > 0.48 s, heart rate 100/min, a QRS axis of +30°, and nonspecific ST and T changes, in a normal rhythm [Figure 1]. The echocardiogram of the patient was normal. The audiometric examination revealed profound bilateral sensorineural deafness. Other investigations including serum electrolytes, a head CT scan, and EEG were normal. He was started on bolus infusion of esmolol in a dose of 100  $\mu$ g/kg/min over 4 min, and which was then increased by 50  $\mu$ g/kg/min until a dose of 300  $\mu$ g/kg/min was achieved. The child remained asymptomatic subsequently. He was given oral metoprolol at a dose of 25 mg four times daily. He had no further seizures. Antiepileptic drugs were stopped. A repeat ECG done after 7 days showed a normal QT interval [Figure 2]. The patient was discharged after 8 days.

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**Figure 1: ECG of the patient showing QTc>0.48 s**

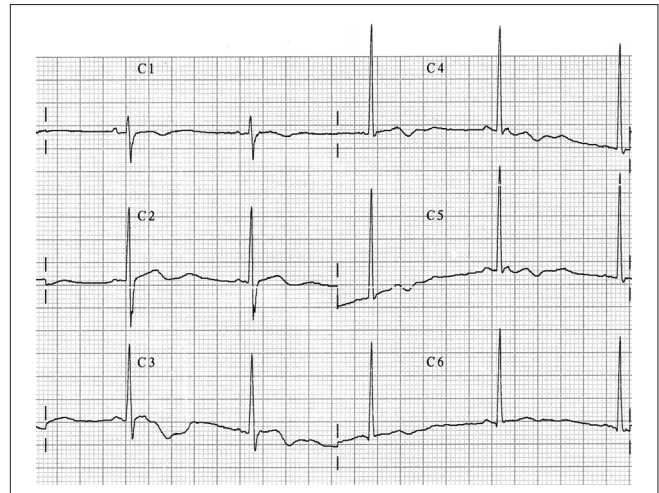
The ECG of all the siblings and the father showed the prolongation of the QTc interval more than that required for diagnosis of LQTS. The ECG of the elder brother showed a QTc interval of >0.50 s, with a QRS axis of  $-45^\circ$ , with the ST depression in all chest leads. The ECG of both the younger brother and father showed a prolonged QTc interval of >0.48 s, but they were asymptomatic. All the asymptomatic family members were put on metoprolol. The patient could neither afford the surgery or the cardiac pacemaker, nor the cochlear implants. Speech therapy and audiological training was given to the patient.

## Discussion

LQTS is more likely to be a congenital etiology in children.<sup>[4]</sup> The congenital form of LQTS can be either a hereditary or nonhereditary sporadic form. Romano–Ward syndrome (RWS) is a common form of LQTS that exhibits autosomal dominant transmission with low penetrance. JLNS is an uncommon form of LQTS, having autosomal recessive transmission, and is associated with congenital deafness. Though our patient had no family history suggestive of LQTS, yet the ECG screening of the immediate family members detected abnormality. He therefore belongs to the hereditary group. The patient was diagnosed with JLNS as he fulfilled the criteria for LQTS and also had congenital deafness.<sup>[5]</sup>

JLNS is more prevalent in Norway and Turkey.<sup>[6]</sup> Commonly found mutations in JLNS are in the genes for potassium channel, KCNQ1 or KCNE1. Both the mutations can be congenital or one congenital and the other one *de novo*.<sup>[7]</sup> Atrophy of stria vascularis, collapse of endolymphatic system, complete degeneration of the organ of corti, and partial degeneration of stria vascularis were the associated pathological findings.

Management consists of  $\beta$ -blockers, implantable cardioverters and defibrillators for the cardiac condition, and cochlear implants for the management of deafness.<sup>[8-10]</sup> Though the standard recommendation is propranolol, yet metoprolol was started based on a pediatric case report from India.<sup>[2]</sup> Beta-blockers significantly reduce the risk of sudden death in LQTS.<sup>[11]</sup> Drugs and circumstances that increase the QT interval



**Figure 2: ECG of the patient showing normal QTc after  $\beta$ -blocker therapy**

such as competitive sports, amusement park rides, scary movies, jumping into the cold water are to be avoided. Testing of the relatives at risk should be done with the annual ECG, hearing evaluation and molecular genetic testing. Training all the family members for cardiopulmonary resuscitation is advisable.

All the affected or at-risk persons were started on  $\beta$ -blockers. The financial constrains limited the treatment to the medical means and cardiac defibrillators or the cochlear implant could not be availed. Nearly a third of symptomatic patients may not respond to  $\beta$ -blocker therapy and pacemaker implantation is the standard recommendation in such cases. The aim was to achieve the normal QT interval. All of them showed great improvement with the drugs with the reduction of the QT interval on ECG. The patient was doing well for the immediate follow-up period but was lost to follow-up after a year.

We have reported a case of JLNS who presented with intractable epilepsy. The cardiac cause of seizures was suspected as the child was hypotensive and pulseless during the episode of seizures. His seizures responded dramatically to  $\beta$ -blocker therapy. Our case showed that a careful examination of the patient should be done during seizures and the cardiac cause should be excluded before labeling refractory epilepsy. This case highlights the importance of suspecting LQTS in a patient presenting with unusual seizures as correct diagnosis not only saves the life of the patient but also helps in getting rid of unnecessary antiepileptic drugs.

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