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Assessment of QT Interval Abnormalities on Electrocardiogram in Children With Breath-Holding Spells

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BASED ON ARTICLE

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SUMMARY

Breath-holding spells are benign, acute paroxysmal, non-seizure episodes that occur during infancy and early childhood and are usually pre cipitated by emotional stimuli [1,2]. Breathholding spells often lead to parenteral stress as child appears lifeless and unresponsive during the episode [2,3]. The incidence of breath-holding spells is 0.1-4% [4,5]. The exact etiopathogenesis for these spells is not known but likely due to autonomic dysregulation, delayed myelination of the brainstem, and iron deficiency anemia [6,7]. Rarely congenital long QT syndrome (LQTS) manifest similar to breath-holding spells with prolongation of QT interval on electrocardiogram (ECG), which can lead to ventricular arrhythmias and sudden death due to cardiac arrest [8,9]. Therefore, it is prudent to evaluate QT interval prolongation to recognize LQTS earlier and prevent further complications. This study was conducted with the aim of to assess QT interval abnormalities on ECG among children with breathholding spells.

Methods: This case control study was conducted from 1 October, 2020 to 30 September, 2022 at the pediatric department of a tertiary care medical college hospital after obtaining institutional research committee approval. Two hundred four children (104 cases and 100 controls) presenting to the outpatient department were included in the study after obtaining written informed consent from parents/guardians. Children aged less than three years with typical history of breath-holding spells or those who had typical spell during examination (witnessed) were included as cases. Healthy children younger than three years with no history of cardiac, neurologic, or endocrine disorders coming for routine vaccination and well-baby clinic were included as controls. Children with primary cardiac disease like congenital heart disease or central nervous system disease like seizure disorder, endocrinal disorders, on history and clinical examination and those receiving drugs from macrolide, quinolone groups, ondansetron and frusemide were excluded from this study. Sociodemographic factors like age, gender and detailed history of the breath-holding spells including age of onset, type (pallid/cyanotic/mixed), triggering factors like anger and/or frustration and pain and/or fear, frequency of spells (minimal: <5/week, average: >5-10/week, high: >10/week) and presence of family history either similar spells in parents or parental consanguinity were noted in a pre-designed form. Details regarding clinical examination including general and systemic examination were carried out and noted.

A 12 lead ECG was performed in the cases and controls. The children with typical history of breath-holding spells were 96 (92.3%) while 8 (7.7%) had a witnessed spell. Out of 104 cases (60 males) with mean age of 16.5 (7.22) months, the mean age of onset of spells was 13.9 (6.24) months. The control group had 100 healthy children (42 females) with mean age of 17.37 (7.96) months. The ECG parameters including mean QT, QTc interval and QTD, QTcD values in breath-holding spells group were significantly prolonged as compared to control group.The children with cyanotic and pallid breath-holding spells were 86 (82.7%) and 18 (17.3%), respectively. The mean QT, QTc, QTD and QTcD values in milliseconds for pallid and cyanotic were 380 (0.04), 520 (0.08), 78.88 (10.78), 123.33 (10.28) and 310 (0.04), 400 (0.04), 57.44 (14.64), 97.90 (15.03), respectively, which showed statistically significant difference ($P<0.001$). The mechanism for increased QT and QTc dispersion may be underlying autonomic nervous system dysfunction as cyanotic and pallid spells are mediated by hyper-sympathetic and hyper-parasympathetic effects, respectively, which may affect QT interval and QT dispersion.

The authors concluded that children with Cyanotic or pallid Breath holding spells had a statistically significant prolongation of QT interval when compared to controls.However Genetic studies were not done in the group with prolonged QT interval to confirm the diagnosis.

COMMENTARY

The commonest cause of Breath Holding Spells in less than 3 years is Iron Deficiency Anemia as most of them are on predominant milk feeds.However Cardiac causes though rare should not be missed while evaluating a child with severe Breath Holding spells mimicking ALTE.It is important to do an ECG and Echocardiogram to rule out underlying Arrythmia or Congenital Cardiac Defect and also an EEG as these episodes can be Seizure mimics. Hence a One time ECG may not be sufficient to make a diagnosis of Long QT syndrome which has a grave prognosis and also needs cardiologist consultation and long term followup.

Hence in severe cases of Breath Holding spells (Cyanotic or Pallid) one should rule out Long QT syndrome and once suspected should always be confirmed with Genetic Tests.

Implications to Practitioners: It is important to get a detailed History and do a thorough physical examination of children with Breath Holding spells.Baseline labs include a Hb,RBC Indices and Peripheral Smear study as most of these children have underlying Iron Deficiency Anemia and starting Iron supplements and reducing milk intake reduces the frequency and severity of spells in most situations.A 12 lead ECG,Echocardiogram & EEG are mandatory as second line investigations in children with Cyanotic or Pallid Spells in whom IDA has also been ruled out.