

## COMMENT



# Successful delivery room management of electromechanical dissociation and heart block: is electrocardiogram useless?

 Cristina Cortes<sup>1</sup>, Eva Vierge<sup>1</sup>, Enrique Criado<sup>1</sup>, Jose Martinez-Orgado<sup>1</sup> and Luis Arruza<sup>1</sup>✉

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We have read with great interest the study by Abbey et al. recently published in *Pediatric Research*.<sup>1</sup> This randomized clinical trial demonstrates that, although feasible, the use of electrocardiogram (ECG) for heart rate (HR) monitoring in the delivery room (DR) neither modifies resuscitation maneuvers nor decreases the time to stabilization in preterm infants. Therefore, the potential benefits of faster and more accurate HR readings compared to pulse oximetry (PO) do not seem to translate into a clinical benefit yet. In our opinion, the important results of this study should not be understood as a confirmation of the lack of usefulness of ECG in the DR. As the authors of this publication acknowledge, time to stabilization may not be the best outcome to assess the utility of ECG. In this regard, we present two cases of severely depressed neonates at birth in which HR monitoring with ECG was critical for the success of DR resuscitation.

The first case is a male newborn of 30 + 1 weeks gestational age born via emergency cesarean section due to persistent fetal bradycardia and hydrops fetalis. Pregnancy was uneventful with normal routine ultrasounds and laboratory tests. The mother was 34 years old and apparently healthy. Prenatal steroids were not administered. At birth, the baby was hypotonic, apneic, hypotonic, and bradycardic. He required intubation, chest compressions, and several doses of intravenous (i.v.) epinephrine. Pleural and peritoneal drainage was performed and 5 ml of serous pleural fluid and 8 ml of ascitic fluid were obtained. Despite resuscitation efforts, HR remained <60 b.p.m. ECG as well as PO were used for HR monitoring from birth. After 10 min of resuscitation, the attending team noticed a dissociation of p and QRS waves on the ECG tracing. AV block was suspected and an intracavitary pacemaker was placed through the umbilical vein after which HR was stabilized at 135 b.p.m. First and fifth minute Apgar scores were 4/4. Cord pH was 7.32 and 6.89 at 30 min of life. The baby was transferred to the neonatal intensive care unit (NICU) with normal HR and SpO<sub>2</sub> of 90% on 100% oxygen. During admission, he developed severe respiratory distress syndrome and pulmonary hypertension with profound hemodynamic instability and died 48 h after birth despite treatment. Maternal systemic lupus erythematosus with positive anti-Ro/La antibodies was diagnosed as the cause of congenital heart block.

The second case is a female neonate of 40 + 2 weeks of gestational age born via emergency cesarean section due to metrorrhagia. Pregnancy was complicated with maternal diabetes treated with insulin. At birth, the baby was hypotonic and apneic, and HR was not detectable by palpation or auscultation. She was intubated and

chest compressions were initiated. PO and ECG monitoring were started from birth. Although no SpO<sub>2</sub> or HR readings were obtained by the PO, a HR of 154 b.p.m. with normal QRS waveforms was detected on the ECG monitor. Electromechanical dissociation secondary to hypovolemia was suspected from the first moments of resuscitation, and consequently, the attending team focused on obtaining an i.v. line for fluid replacement. Catheterization of the umbilical vein failed so an intraosseous line was placed. An initial dose of epinephrine was administered immediately followed by a bolus of saline. After a second bolus of saline, a HR was detected by auscultation and palpation. O Rh negative blood was transfused with normalization of HR and global improvement of the baby's condition. First, 5th, 10th, and 15th minute Apgar scores were 0, 0, 0, and 5, respectively. She was transferred to the NICU with signs of moderate–severe hypoxic–ischemic encephalopathy upon admission and treated with therapeutic hypothermia. After 18 days, she was discharged home with normal brain magnetic resonance imaging.

In recent international resuscitation guidelines, the ECG is recommended as an important adjunct for HR monitorization.<sup>2</sup> However, to date, there are no clear recommendations on how this new HR information should be interpreted and under what circumstances resuscitation maneuvers should or should not be modified accordingly. Various studies have shown that the information provided by ECG differs somewhat from that of PO in certain moments of DR resuscitation, probably as a consequence of some peculiarities of transitional physiology.<sup>3, 4</sup> Therefore, its interpretation and the actions taken in response to it should probably differ as well. The two cases presented here, as well as previous reports, although anecdotal, are illustrative of how the information provided by the ECG may in certain situations be the key to determining the underlying cause of postnatal depression during DR stabilization and guide resuscitation maneuvers.<sup>5, 6</sup> Interestingly, early identification of reversible causes of cardiac arrest is emphasized in the most recent update of pediatric resuscitation guidelines.<sup>7</sup> By contrast, some studies have raised concerns about how faster HR readings provided by the ECG may prompt unnecessary interventions probably due to misinterpretation of physiologic bradycardia immediately after birth.<sup>8</sup>

The introduction of a new monitoring tool in the DR without sufficient knowledge of how to handle the information generated may limit the demonstration of a benefit from its use in clinical trials. Pulseless electrical activity and congenital heart block are good examples of situations in which ECG could play a specific role during resuscitation at birth.<sup>5, 6</sup> Although electromechanical

<sup>1</sup>Division of Neonatology, Instituto del Niño y del Adolescente, Hospital Clínico San Carlos -IdISSC, Madrid, Spain. ✉email: [luisarruza@yahoo.es](mailto:luisarruza@yahoo.es)

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dissociation has been acknowledged as a limitation of ECG, an adequate interpretation of the information provided by ECG in combination with PO and clinical data, as illustrated by our second case, maybe the fastest way to recognize and correct this situation. In view of the faster readings and higher reliability of ECG during bradycardia, other potential strengths of its use could be timely detection of these episodes and a quicker assessment of the efficacy of resuscitation maneuvers.<sup>1, 3, 4, 8</sup> Similarly, ECG could contribute to determining the relevance of bradycardia in order to decide the need for treatment. More studies are still needed to clarify these questions to ultimately determine in clinical trials the potential benefit of the ECG in the DR.

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## AUTHOR CONTRIBUTIONS

L.A. wrote the initial draft of the manuscript. C.C., E.V., E.C., and J.M.-O. collaborated in gathering the data and critically reviewed the manuscript. All the authors listed have reviewed the final version of the manuscript, gave their approval before its submission, and take full responsibility for it.

## COMPETING INTERESTS

The authors declare no competing interests.

## ADDITIONAL INFORMATION

**Correspondence** and requests for materials should be addressed to Luis Arruza.

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