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Letter to the Editor

Ultrasonic Pocket Doppler, novel technology for fetal and neonatal heart rate assessment

To the Editors,

We read with interest the excellent article by Johnson et al.¹ that systematically reviewed the literature about accuracy, latency, and efficacy of novel technologies for heart rate (HR) assessment during neonatal resuscitation.

As noted by the authors, clinical assessment of newborn HR has been reported to be inaccurate² and there are disagreements as to the best novel method (i.e. digital stethoscope, electrocardiography, photoplethysmography, pulse oximetry (PO), Doppler ultrasound (DU), . . .) to measure HR.

Determining the fetal HR by DU was one of the earliest uses of electronic technology in recent times. During pregnancy, DU is routinely used to measure the fetal HR in cardiotocography (CTG) and has become both reliable and low-cost technology. Recently, this technique has been used to monitor a newborn's HR immediately after birth in animal and human models, but no studies validated its clinical accuracy and efficacy.³ Nevertheless, it would seem logical to continue to use DU immediately after birth, until at least a reliable pulse oximetry (PO) signal can be obtained, when the most critical decisions on neonatal resuscitation need to be made.

Our aim was to determine if a new generation, ultrasonic pocket Doppler, could offer a novel method of quickly and effectively assessing neonatal HR after elective cesarean delivery, in comparison to PO monitoring.

A physician and a midwife assessed the HR using both the DU (SD1 Ultrasonic Pocket Doppler® Edan Instruments Inc., Shenzhen, China) that obtains a combination of built-in speaker and fetal heart rate digital display (which can use an Android or iOS interface), and the PO (MasimoRadical-7® Soma Technology Inc. Bloomfield, CT, USA) trace. A video-recording with a timed camera (i.e., with a timer displayed on video) was carried on in both modalities to more precisely assess the actual time to first heart rate signal detection. Using conventional technology and a 3 MHz probe, SD1 breaks through the limitation of the probe angles as well as the depth of the fetal heart, locating the fetal and neonatal HR signal quicker and easier anywhere and everywhere, even without the gel application.

Twenty-five healthy neonates delivered at term via elective cesarean section were consecutively recruited. Both HR assessment modalities were used in all neonates. Built-in speaker HR signal was almost simultaneous to the probe application at precordial area of the newborn, and the median (IQR) time from device application to first HR

rate display was significantly lower than the PO HR [3 (2–8) vs 26 (15–75) seconds, $p < 0.001$]. The median (IQR) recorded HR values of DU and PO were comparable [140 (1128–176) vs 136 (124–170) bpm, $p = 0.55$].

This novel DU approach is a valuable technological development in neonatal care and is a quicker method of recording HR compared with PO in our study. Ultrasonic pocket Doppler may offer an excellent performance and versatility to easily locate and document the HR signal in fetal and neonatal monitoring. More research is needed on this methodology before its clinical use in neonatal resuscitation.⁴

Author's Contribution

Conception and design: VZ, MP
Literature research: VZ
Critical revision of the article: MP
Final approval of the article: VZ, MP

Funding sources

The authors have not declared specific grant for this research from any funding agency in the commercial or not-for-profit sectors.

Competing interest

None declared.

Patient consent

Parental/guardian consent obtained.

Ethics approval

Ethics Committee Policlinico Abano Terme.

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Received 1 September 2019

<http://dx.doi.org/10.1016/j.resuscitation.2019.09.037>

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