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Case Report

Prediction of Imminent Jeopardy for Growth Restricted Fetus Using Handheld Fetal Doppler as A Viable Alternative in Resource Constrained Environment: A Case Report

Daniel N Onwusulu[1], Mbachu Ikechukwu I Mbachu[2], Confidence C Ogbomade[3], Sunday E Jombo[4], John E James[5]

1&2. Department of Obsterics & Gynaecology, Faculty of Medicine, Nnamdi Azikiwe University, Awka, Anambra state; 3&5. Department of Obstetrics & Gynaecology, Nnamdi Azikiwe University Teaching, Nnewi, Anambra state; 4. Department of Obstetrics & Gynaecology, Federal medical center, Asaba Delta state, Nigeria

Abstract

Intensive, and sometimes very expensive antenatal monitoring is often required in fetal growth restriction (FGR) to prevent prematurity and intrauterine jeopardy. This may not be feasible in a low resource setting. We report a 31-year-old gravida 3 para 2 +0. She had static fetal growth from 31weeks. Umbilical artery doppler velocimetry revealed a resistance index of 0.71. A week later, she complained of reduced fetal movement. On the real time and cardiograph modes of handheld fetal doppler, fetal heart rate of 151 to 153beats per minute, and almost straight-line fetal heart rate tracing (absent baseline variability) were obtained; imminent fetal jeopardy was suspected. She declined immediate abdominal delivery, despite adequate counselling. Four days later, she had an intrauterine fetal death and still birth with weight of 1.3kg and no obvious abnormality. Simple handheld doppler can be used to predict imminent death of a growth restricted fetus, in low resource setting.

Keywords: Handheld Fetal Doppler, Cheap, Simple, Foetal Growth Restriction Low Resource Setting, Case-Report.

Correspondence:
Dr Daniel Onwusulu
Department of Obstetrics and Gynaecology
Nnamdi Azikiwe University, Awka.
dn.onwusulu@unizik.edu.ng

Introduction

Fetus is growth restricted if it fails to reach its genetically predetermined growth potential at any gestational age because of maternal, placental, or fetal factors. Also, using Hadlock's fetal growth standard, a fetus is growth restricted if its estimated weight or abdominal circumference is less than 10th percentile[1]. This definition does not, however, differentiate between small for gestational age (SGA) that may be constitutionally normal or appropriate for gestational (AGA) but are compromised. Hence the evolution of newer definition based on the Delphi consensus criteria[2]: a very small fetus (abdominal circumference (AC) or estimated fetal weight (EFW) <3rd percentile, or a small fetus (AC or EFW <10th percentile with additional abnormal doppler findings, or a decrease in AC or EFW by 50th percentile (2 quartiles) or more). This complicates about 3% to 9% of pregnancies in developed countries and 25% in low- and middle-income countries[3].

It is a major contributor of perinatal morbidity and mortality and may result in neurologic developmental delays in childhood, and metabolic and cardiovascular diseases later in life(3). Fetal growth restriction can occur early or late in pregnancy (≤ or > 32 or weeks)(2). At early gestation, it is easy to diagnose but difficult to manage while at later gestation, it is difficult to diagnose but easy to manage[4].

Antepartum monitoring in early onset IUGR is very demanding; there must be a balance between the

hostile intrauterine environment and the risk of prematurity following delivery. The monitoring includes maternal perception of fetal movement, serial symphysio-fundal height, ultrasound fetal growth monitoring, biophysical profile and doppler velocimetry, stress, and non-stress test, and biochemical markers.

Doppler velocimetry and cardiotocograph are lacking in most facilities in low resource settings. Reduced or absent fetal movement alone has low sensitivity and predictive value for adverse fetal outcome in high-risk pregnancy[5]. The simple handheld doppler, equipped with about five modes including real time, and cardiograph, in combination with fetal movement assessment could be helpful. It is a battery-operated ultrasound device which is usually placed on the maternal abdomen, over the fetal back, for evaluation of the fetal heart rate.

We report a case of fetal growth restriction where the handheld doppler device was used, not just for baseline fetal heart rate, but for its variability and reactivity (non-stress test) following maternal complaints of reduced fetal movement.

Case Report

Our client was a 31-year-old gravida 3 para 2 with two living children and no miscarriages. She booked for antenatal care at 11completed weeks of pregnancy with no complaints. Pregnancy was desired and spontaneously conceived. She was not hypertensive or diabetic. Her blood group was O Rhesus positive, and genotype was AA. Other booking parameters were also normal.

Her previous pregnancies in 2019 and 2021 where complicated by preterm premature rupture of membranes at 32 weeks with outcome of male babies weighing 1.9kg and 1.8 kg respectively.

She received her routine antenatal care. She developed widespread papular rash at 23 weeks gestational age; she was managed for allergic rash with loratidine with good outcome.

She maintained steady healthy weight gain; symphysio-fundal height corresponded with gestational age until 31 to 33weeks when it remained static at 29cm; estimated foetal weight was 1.2kg with reduced liquor volume.

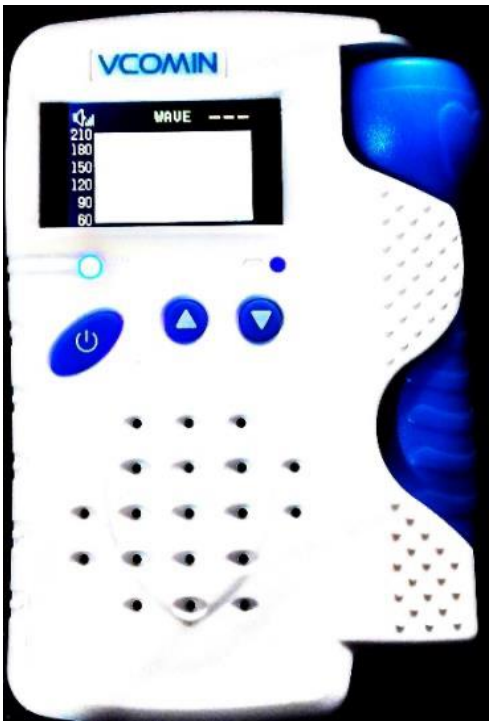

Fig.1 Handheld foetal Doppler with multiple display modes - VCOMIN FD200

Figure 2.0

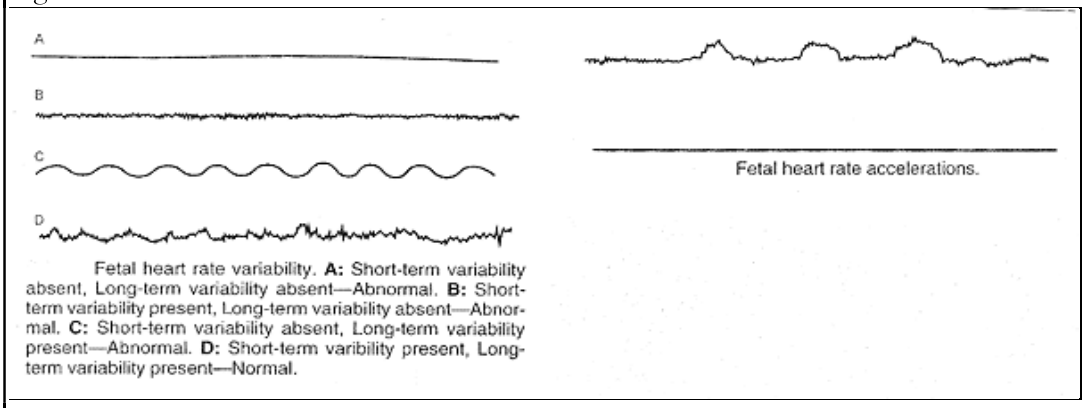

Image credit: womenshealthsection.com

Figure 2.0, Fetal heart rate variability patterns and accelerations.

Doppler velocimetry revealed mildly increased resistance index, 0.71. A week later, patient complained of reduced foetal movement. A real-time cardiography using a handheld foetal doppler with multiple display modes, including Realtime, and cardiograph (e.g., VCOMIN Foetal Doppler FD200; Fig.1.0) revealed a foetal heart rate of 151-153beats per minute with absent baseline variability for almost 5 minutes (fig. 2.0). An assessment of foetal growth restriction with suspected placental insufficiency with high risk of foetal jeopardy was made. She was counselled for emergency caesarean section, but she declined. She was, therefore, asked to maintain a daily foetal kick chart.

Four days later, she represented; examination revealed absent foetal heart rate and was confirmed with ultrasonography. She was counselled on the diagnosis of intra-uterine foetal death. She gave consent for delivery. She had cervical ripening using misoprostol. She transited to labour and subsequently had delivery of a macerated stillbirth that weighed 1.3kg. No gross identifiable congenital anomaly was noted. She was managed, counselled, and discharged.

Discussion

Foetal growth restriction (FGR) is associated with serious management dilemmas. The challenge depends on whether it is the early or late phenotype; while it is easier to diagnose but more difficult to determine the timing for delivery in the early phenotype, the reverse is the case for the late type[3]. To reduce the problems associated with prematurity, intensive monitoring is very imperative.

However, there is no single or ideal modality of antenatal monitoring, rather they are usually combined for optimal outcome. The simplest of all is the maternal perception of reduced foetal movement; used alone, it has poor predictive value for adverse foetal outcome[5].Other monitors include umbilical artery (UA), middle cerebral artery (MCA) and ductus venosus (DV) doppler velocimetry, non-stress, and contraction stress test (NST, CST), and serum biomarkers.

Our patient had early onset foetal growth restriction, but the UA velocimetry did not reveal significant abnormalities[7] like increased pulsatility index (quantitative description) or absent/reversed end diastolic flow (qualitative description). Changes in the vessels would have preceded that of the biophysical parameters including NST and foetal movement. This may have been related to the infrequent doppler velocimetry due to financial constraint.

Monitoring with the timing of delivery to avert risks due to prematurity is a major challenge in the management of early onset foetal growth restriction. Expensive methods may not be used frequently, as in our patient. Also, there is no consensus on the frequency and method of surveillance[6]. Nevertheless, most would recommend umbilical artery doppler for early onset FGR and cardiotocography for timing of delivery[6]. This was applied to our patient.

From "The Trial of Randomized Umbilical and Fetal Flow in Europe" (TRUFFLE) study on management of preterm FGR between 26-32 weeks[8], timing of delivery has been recommended based on the presence of late changes in Doppler venosus (DV) or abnormal CTG. However, whether computerized CTG (cCTG) or the visual CTG, as used in our patient, has better outcome is not yet established[9–11]. The cCTG reports short term/beat to beat fetal heart rate variability and is believed to have reduced intra and inter observer variation obtainable with visual CTG[12]. The visual CTG does not differentiate between short- and long-term baseline fetal heart rate variability.

The baseline variability is abnormal when both the short- and long-term variability are absent, or either one of the two is absent (fig.2.0). Or it can be described as minimal, moderate, or increased[13]. Absent/minimal variability, with or without spontaneous deceleration, as in our patient, is an ominous sign and depicts onset of hypoxia with progression to acidaemia[4]. Hence would warrant immediate delivery to avert the risk of stillbirth[6]. With the handheld doppler, the absence of baseline variability was noted; she was counselled for immediate abdominal delivery; she objected with consequent fetal loss.

Implication for clinical practice. Simple handheld battery operated doppler, could be an alternative to the complex/expensive machines or methods to predict imminent foetal demise when there is growth restriction in low resource setting. However, large scale comparative cohort study will be required for further confirmation and its widespread application.

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