FETAL HEART RATE (FHR) VARIABILITY IN OBSTETRIC CHOLESTASIS (OC)

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Introduction: Unexpected intrauterine fetal death in late gestation has been repeatedly reported in women with OC. This could be a consequence of altered cardiac conduction, presumably induced by increased bile acid concentration (BAC).

Methods: The trans-abdominal fetal e.c.g. was acquired over ~12h using a Monica AN24 FHR monitor (Monica Healthcare Ltd, Nottingham)[1]. FHR was derived from the RR interval. The short term variability (STV) was calculated according to Dawes and Redman based on the 3.75second FHR averages. The root mean square of successive difference (RMSSD), a measure of true beat-to-beat variability, was also calculated. Data are summarised as mean ± s.d. or median [IQR].

Results and Discussion: Technically-satisfactory recordings of the fetal e.c.g. were obtained from 17 women with OC (pruritus with serum BAC >14μmol/L or ALT >100U/L) and 17 women with uncomplicated pregnancies (NP). Median gestation ages at the time of recording were 30 – 38 weeks in OC and 29 – 38 weeks in NP (P>0.1); median [IQR] BAC in OC was 38 [20 – 58]μmol/L and ALT was 124 [75 – 159]U/L).
A worse fetal outcome has been described in women with BAC ≥40μmol/L[2]. Seven women had BAC ranging between 43 - 187μmol/L (median 67μmol/L), while 10 OC were <40μmol/L (median 22.5μmol/L). We therefore analysed the OC data in two groups, mild or moderate/severe. Neither FHR nor STV differed between groups (Table 1; P>0.5, P>0.8). However, the RMSSD was significantly higher in babies of women with moderate/severe OC than in either controls (P = 0.015) or those with mild OC (P = 0.008; ANOVA). Linear regression analysis revealed a highly-significant impact of individual BAC on RMSSD (P = 0.008) and an inverse association with gestation age (P = 0.016).

	Normal (n = 15)	**Mild OC (n = 10)**	**Moderate/severe OC (n = 7)**
FHR (bpm)	138.4±6.7	137.8±6.3	135.4±5.2
STV (msec)	10.3±1.9	10.7±1.7	10.6±2.1
RMSSD (msec)	10.6±1.2	10.3±0.9	12.2±2.0

Table 1

We believe this to be the first time that a link has been observed between raised BAC and an alteration in an index of fetal vagal cardiac control, the RMSSD. The ability to record the beat-to-beat fetal e.c.g. transabdominally with the very small Monica AN24 monitor has allowed us to record for up to 16 hours overnight, with minimal maternal inconvenience, while she was completely relaxed.

Comment: This will facilitate the identification of subtle changes in FHR variability and could reduce or abolish the need for alternate day use of antenatal cardiotocography in women with OC.

References:

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2. Glantz, A., *et al.* (2004) Intrahepatic cholestasis of pregnancy: Relationships between bile acid levels and fetal complication rates. *Hepatology* 40, 467-474