



Excessive fetal movements are a sign of fetal compromise which merits further examination

Alexander E.P. Heazell^{a,b,*}, Tomasina Stacey^c, Louise M. O'Brien^d, Edwin A. Mitchell^e, Jane Warland^f

^a Maternal and Fetal Health Research Centre, School of Biological Sciences, Faculty of Biology, Medicine and Health, University of Manchester, UK

^b St. Mary's Hospital, Central Manchester University Hospitals NHS Foundation Trust, Manchester Academic Health Science Centre, Manchester M13 9WL, UK

^c School of Healthcare, University of Leeds, Leeds LS2 9JT, UK

^d Sleep Disorders Center and Department of Obstetrics & Gynecology, University of Michigan, Ann Arbor, MI, USA

^e Department of Paediatrics: Child and Youth Health, University of Auckland, Auckland 1142, New Zealand

^f Mothers, Babies and Families Research Group, School of Nursing and Midwifery, University of South Australia, 5001, Australia



A B S T R A C T

Changes in fetal movement are associated with increased risk of stillbirth after 28 weeks of pregnancy. The majority of studies have focussed on maternal perception of reduced fetal movements, which is associated with stillbirth via placental dysfunction. Recent studies have also described an association between a single episode of excessive fetal movements and late stillbirth. We present a hypothesis that a sudden episode of excessive fetal activity indicates fetal compromise relating to underlying disturbance of the in utero environment, which if it persists can lead to fetal death. The origin of the excessive fetal movements is unknown; they may represent fetal seizures induced by asphyxia or infection, an attempt to release cord entanglement or a change in fetal behaviour (inducing signs of distress) in response to a noxious stimulus. It is also possible that an increase in maternal anxiety may lead to increased perception of fetal activity.

Current evidence regarding excessive fetal movements is sparse; there is no clinical guidance regarding how reporting of this symptom might relate to a fetus at risk and which management might reduce the risk of subsequent stillbirth. This could be addressed by prospective observational studies of mothers presenting with excessive fetal movements which could both explore the underlying pathophysiology and determine which investigations could identify fetal compromise in this population. The presence of fetal seizures or umbilical cord entanglement could be evaluated at the time of presentation by cardiotocography and ultrasonography of the fetus and cord. Exposure to infection or noxious stimuli could be evaluated by maternal history and measurement of maternal blood for inflammatory markers or toxins. Maternal anxiety could be assessed by validated anxiety scores. Fetal outcome following excessive fetal movements can be recorded after birth. In addition, the presence of perinatal asphyxia can be assessed using Apgar scores, assessment of fetal acidemia or measurement of stress-related factors in umbilical cord blood. The placenta and cord can be systematically examined for signs of hypoxia, infection or umbilical cord compression. Such studies would provide evidence regarding the underlying cause of excessive fetal movement and how this symptom might relate to in utero compromise and stillbirth. Ultimately, this approach will determine whether excessive fetal movements can be used alongside reduced fetal movements as a tool to reduce the perinatal mortality rate.

Introduction

Worldwide there are 2.6 million stillbirths each year [1]. The majority of stillbirths occur largely in low and middle-income countries (LMICs); in these settings stillbirths are frequently related to access to adequate care in pregnancy and labour [1]. In high-income countries (HICs) and settings where these issues have been addressed, other risk

factors for stillbirth are being investigated to identify women at increased risk of stillbirth. Established risk factors include nulliparity, advanced maternal age, women from minority ethnic groups, hypertension, maternal obesity, and cigarette smoking [2]. Unfortunately, few of these risk factors are amenable to modification in pregnancy. This has led to exploration of modifiable risk factors that include maternal signs and symptoms. The mostly commonly studied maternal

* Corresponding author at: Maternal and Fetal Health Research Centre, 5th floor (Research), University of Manchester, St Mary's Hospital, Oxford Road, Manchester, UK.
E-mail address: alexander.heazell@manchester.ac.uk (A.E.P. Heazell).

Table 1
Summary of recent studies investigating the association of reduced fetal movements and excessive fetal movements with stillbirth.

Study Identifier	Study type	Question	Women who experienced stillbirth		Women with live births		Unadjusted Odds Ratio	
			Reduced Fetal Movements (%)	Excessive Fetal Movements (%)	Reduced Fetal Movements (%)	Excessive Fetal Movements (%)	Reduced Fetal Movements	Excessive Fetal Movements
Rayburn et al. 1983	Cohort	Participants kept diaries during pregnancy	-	-	-	47 (5%)	-	-
Stacey et al. 2011	Case-Control	Participants were asked to describe their baby's movements, in particular whether any change in frequency or strength had occurred AND whether they had perceived vigorous movement	45 (29.0%)	32 (20.8%)	36 (11.6%)	16 (5.2%)	2.16 (1.24–3.77)	4.51 (2.23–9.10)
Warland et al. 2015	Cohort	Once you were aware of your baby's usual pattern of movements was there any time that your baby's movements were unusual?	522 (30.5%)	146 (8.5%)	-	-	-	-
Linde et al. 2015	Cohort	How do you remember the fetal movement during the 48 h that preceded the diagnosis of intrauterine death?	106 (69%)	22 (10%)	-	-	-	-
Heazell et al. 2017	Case-Control	Once you were aware of your baby's usual pattern of movements was there any time that your baby's movements were unusual?	56 (40%)	42 (30.4%)	32 (8.4%)	24 (6.7%)	12.9 (7.17–23.4)	4.24 (2.36–7.62)

symptom to date is maternal perception of reduced fetal movements (RFM) [3]. RFM is hypothesised to be associated with adverse pregnancy outcome through placental dysfunction [4]. In combination with findings from confidential enquiries into antepartum stillbirths [5,6], this observed association has led to the development of guidelines to improve information for women and standardise care following maternal perception of RFM [7].

In recent years a series of studies have been conducted to identify additional modifiable factors associated with stillbirth that can subsequently be used to direct intervention to reduce the incidence of stillbirth. These studies have largely been retrospective case-control studies exploring factors including: maternal sleep position, mother's experience of fetal movements, diet, exercise, and maternal intuition [8–10]. Other approaches have included cohort studies exploring the experience of mothers whose pregnancies have ended in stillbirth [11]. With regard to maternal perception of fetal movements these studies have confirmed the association between stillbirth and RFM (findings are summarised in Table 1). However, in addition to RFM, emerging data now suggest that excessive fetal movements are a risk factor for stillbirth.

The STARS cohort study of 1714 women from more than 7 countries described excessive fetal movement in 8.5% of respondents [11]. This increase was described as much more active or aggressive e.g. “the day before he died he was especially busy and moving like crazy.” The frequency of symptoms was consistent amongst respondents from the four main countries participating in the survey. The frequency of perception of excessive fetal movements was also similar to the 10% of respondents analysed in a questionnaire study of women who experienced a stillbirth in Sweden [12]. These movements were described as “very lively”, “death-jerk”, “intense” and “cramped”. This period of excessive fetal movement was then followed by no movement or only limited movement. Interestingly, this symptom was more frequently reported after 37 weeks gestation (12% of respondents) compared to 28–36 weeks gestation (7%), suggesting that the excessive fetal movement is associated more frequently with late stillbirth [12].

Case-control studies have been employed to determine whether the frequency of such symptoms differs between pregnancies ending in stillbirth and those resulting in live births. The Auckland Stillbirth Study found that a single episode of ‘more vigorous movement than normal’ was 6-fold more common in women who had a stillbirth (being reported by 20.8% of mothers who had a stillbirth, Odds Ratio (OR) 6.81, 95% Confidence Interval (95% CI) 3.01–15.41) [13]. In contrast, women who had a stillbirth were less likely to perceive more than one episode of vigorous fetal activity (OR 0.58, 95% CI 0.33–1.03). Furthermore, a general perception of increased fetal movements was less frequently reported by women who had a stillbirth compared to controls (OR 0.24, 95% CI 0.12–0.50) [13]. In the STARS case-control study women who experienced a stillbirth were more likely to perceive one episode of vigorous activity described using words such as “crazy or frantic” (OR 4.24, 95% CI 2.36–7.62) and the controls more likely to report gradual increase or multiple episodes of increased activity described as “strong or powerful” [14].

These more recent observations reflect those in older studies between 1977 and 1983 when women were asked to keep a daily record of any perceived strong fetal movements [15]. Signs of fetal hyperactivity were diagnosed in 5% of women. Nine cases (19%) involved umbilical cord complications, but none of the infants were growth restricted or had evidence of compromise at delivery (e.g. need for neonatal resuscitation), or had any signs of seizure disorders in the neonatal period. Consequently these authors concluded that excessive fetal movements was not a worrying sign [15]. Conversely, a study by Sadowsky et al. described that any “sudden, strong, vigorous movements with increased rate followed by cessation was almost invariably a sign of acute fetal distress and fetal death”, the authors speculate that this may be the attempt of the fetus to release a complication if, for example, a cord entanglement was released then normal fetal movements

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