

Cord entrapment in a footling breech presentation with decreased fetal movements

Zachary M. Ferraro MD PhD, Orli M. Silverberg MD, John C. Kingdom MD, Lindsay Shirreff MD MSc(HQ)

■ Cite as: *CMAJ* 2023 November 27;195:E1577-9. doi: 10.1503/cmaj.221264

A 28-year-old woman presented to the obstetric triage unit at 35 + 5 weeks' gestation with an acute decrease in fetal movements during the previous 12-hour period. A previous pregnancy had resulted in an early spontaneous abortion. The current pregnancy was complicated by pre-existing type 2 diabetes, hypothyroidism and intrahepatic cholestasis of pregnancy, managed with insulin, thyroid supplementation and ursodiol, respectively. Each condition was stable, with no decreasing insulin requirements; the patient's level of serum total bile acids was 22 µmol/L (abnormal at > 10 µmol/L, but ominous at > 40 µmol/L) at presentation. One week earlier, third-trimester ultrasonography had shown breech presentation and appropriate fetal growth, with a normal umbilical artery Doppler and volume of amniotic fluid. The biophysical profile — which assesses fetal breathing, tone and movement — in addition to amniotic fluid volume was reassuring, with a maximum score of 8 points.

In triage, maternal vital signs were normal. A nonstress test showed reduced fetal heart rate variability, accompanied by prolonged (> 60 s) deceleration to as low as 90 beats/min (Figure 1). An abnormal fetal heart rate tracing of this nature at this gestational age may be sufficient to warrant delivery, but given the accessibility of high-quality obstetric imaging, we immediately performed comprehensive ultrasonography, which showed breech presentation and a biophysical profile of 4 points (lack of fetal breathing and tone). We also observed

Key points

- Cord obstruction events account for one-fifth of stillbirths in the absence of structural or genetic defects.
- At present, use of fetal movement counting in the third trimester is the only effective screening test for cord obstruction.
- Patients who present with decreased fetal movement should undergo thorough investigation with a nonstress test and comprehensive ultrasonography.

serious Doppler abnormalities, including absent end-diastolic flow velocities in the umbilical arteries (Figure 2) and redistribution of blood flow in the middle cerebral artery (pulsatility index 1.01), accompanied by substantially elevated peak systolic velocities for gestational age (88 cm/s; normal value < 70 cm/s at 35 wk gestation). These findings indicated abnormal blood flow to the fetus, often described as brain-sparing redistribution of flow. We performed an urgent cesarean delivery because of the fetal status and because the patient was not in labour. At delivery, the umbilical cord was tightly wrapped 4 times around the infant's ankle and once around the infant's neck (Figure 3).

Apgar scores were 3 and 9 at 1 and 5 minutes, respectively. We discharged the mother and baby 48 hours after delivery, and they have both had an uncomplicated postpartum and neonatal period.

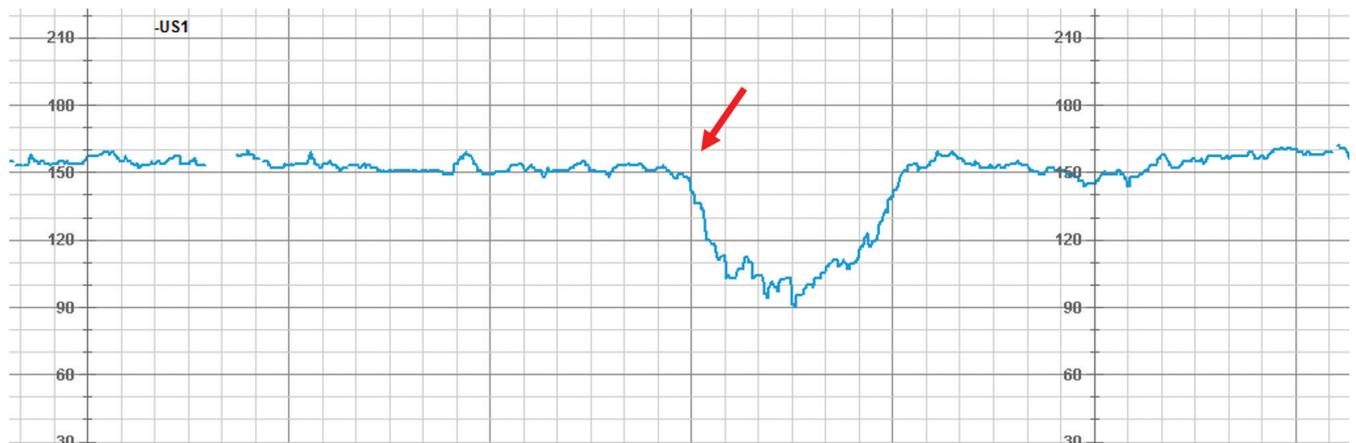


Figure 1: Segment of nonstress test in a 28-year-old woman at 35 + 5 weeks' gestational age showing reduced fetal heart rate variability and a prolonged deceleration (arrow) to 90 beats/min.

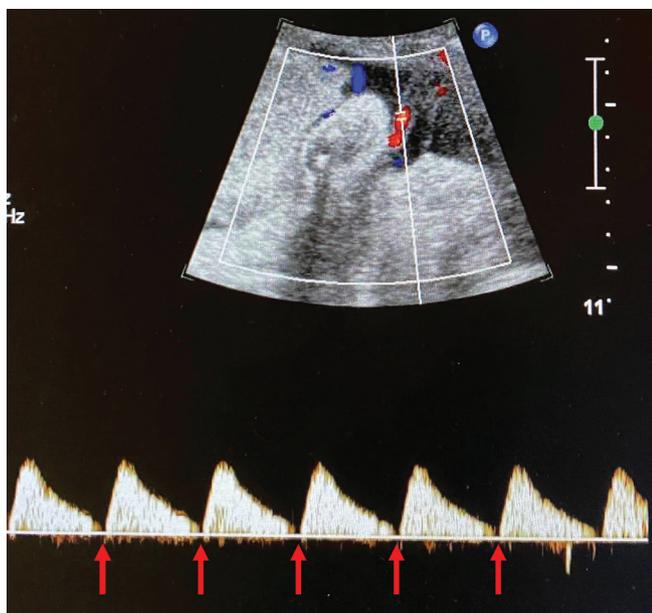


Figure 2: Doppler ultrasonogram of a 28-year-old woman at 35 + 5 weeks' gestational age showing absent end-diastolic flow velocity (arrow) in the umbilical arteries.

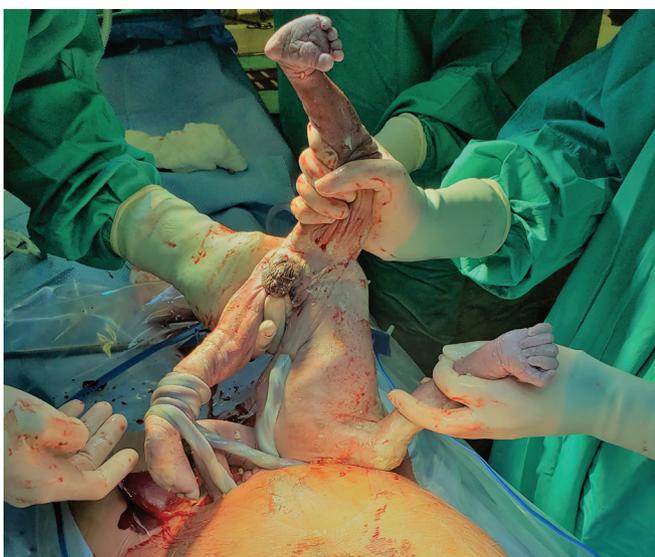


Figure 3: A fetus (35 + 5 wk gestation), delivered by cesarean, with a nuchal cord and limb entanglement; the umbilical cord was tightly wrapped 4 times around the infant's ankle and once around the infant's neck.

Discussion

Stillbirth is defined in Canada as fetal loss after 20 weeks' gestation or at a weight greater than 500 g,¹ and occurs in 3 per 1000 births in North America.² It can be caused by maternal, fetal or placental factors,¹ with about 20% of stillbirths attributable to compromised circulation of the umbilical cord.³ The incidence of stillbirth from cord accidents has remained largely unchanged despite improvements in ultrasonography-based fetal surveillance. In 1 review, cord accident was responsible for 28% of all stillbirths after 32 weeks' gestation.² In a Finnish study of stillbirths over a 10-year period, 16% of fetal demise was attributed to umbilical cord loops or knots.⁴

The umbilical cord has protective features that reduce the likelihood of cord accidents. Placental arterial supply is protected by the Hyrtl anastomosis, an intra-arterial shunt, in most pregnancies;⁵ Wharton jelly protects cord vessels.⁶ Despite these features, cord accidents are an important cause of stillbirth. Mechanisms underlying cord obstruction most commonly involve excessively long, hypercoiled cords,² but may also involve cord stricture, knots and prolapse.²

Although mechanisms leading to cord entrapment are not entirely understood, risk factors include excessive cord length, polyhydramnios, multiparity and diabetes.⁴ Patients with identified risk factors may be counselled to focus on counting fetal movements as a strategy to mitigate risk,⁵ but routine ultrasonography is not an effective surveillance modality for functional cord entrapment given a high rate of false positives.⁵ Detection of an umbilical cord knot or nuchal cord on ultrasonography has not been shown to reduce morbidity and mortality, and normal ultrasonography does not necessarily prevent a negative outcome.^{2,5} This point is highlighted by our case where ultrasonography was reassuring 1 week before presentation and did not predict subsequent cord entanglement.

In the absence of effective screening for cord vulnerability with ultrasonography, clinicians and patients rely on counting fetal movements, where a window of opportunity may exist to prevent fetal demise arising from inadequate oxygenation. In situations where the patient perceives a decrease in fetal movement, the Society of Obstetricians and Gynaecologists of Canada (SOGC) recommends using a threshold of fewer than 6 movements over a 2-hour period to seek medical advice.⁷ Decreased fetal movement is therefore a common presentation to obstetric triage units, warranting comprehensive investigation and potential delivery, depending on overall findings.⁸ Although we performed detailed ultrasonography, an abnormal fetal heart rate tracing alone may be sufficient to justify imminent delivery, depending on gestational age.

Although most patients with decreased fetal movement will have favourable outcomes, it may be a harbinger of fetal compromise. True decreased fetal movement is thought to result mainly from hypoxemia in the fetus, leading to acidosis, which leads to reduced limb movements.⁹ Half of pregnant people who experience stillbirth have preceding subjective symptoms of decreased fetal movement. Patients with 2 or more episodes of decreased fetal movement are at increased risk of stillbirth compared with those with only 1 episode,⁹ and a reduced perception of the strength of fetal movements may be relevant when detected before 37 weeks' gestation.¹⁰

Limitations of fetal movement counting as a screening tool include subjectivity of both reporting and counselling. Despite SOGC guidance of 6 movements in 2 hours, counselling may differ between practitioners, and patient perception of movement is variable. Monitoring fetal movements may also increase the number of antenatal visits by 2–3 per 100 pregnancies.⁷ These visits may prompt additional investigations such as nonstress tests and ultrasonography, and may contribute to increased maternal anxiety.⁷ Results of such investigations may lead to further intervention. For example, when the decision about delivery is made solely on fetal heart rate tracings, without comprehensive ultrasonography,

the preterm delivery may not be necessary and the risk of perinatal morbidity is increased.⁹ Despite limitations of fetal movement counting, it remains a surveillance recommendation given its accessibility, low associated risk and potential to decrease adverse clinical outcomes.⁷

Although cord accidents contribute to about one-fifth of stillbirths in the absence of genetic or structural defects, no effective ultrasonography screening techniques exist to reduce the rate of poor outcomes. Detecting decreased fetal movement may mitigate the risk of stillbirth. More research is required to find appropriate screening tools to prevent stillbirth arising from umbilical cord complications.

References

1. Hammad IA, Blue NR, Allshouse AA, et al. Umbilical cord abnormalities and stillbirth. *Obstet Gynecol* 2020;135:644-52.
2. Hug L, You D, Blencowe H, et al. Global, regional, and national estimates and trends in stillbirth from 2000 to 2019: a systematic assessment. *Lancet* 2021;398:772-85.
3. Liu LC, Huang HB, Yu MH, et al. Analysis of intrauterine fetal demise—a hospital-based study in Taiwan over a decade. *Taiwan J Obstet Gynecol* 2013;52:546-50.
4. Lehtonen T, Markkula T, Soidinsalo P, et al. Causes of stillbirth in Turku, Finland, 2001-2011. *Pediatr Dev Pathol* 2017;20:5-15.
5. Sherer DM, Amoabeng O, Dryer AM, et al. Current perspectives of prenatal sonographic diagnosis and clinical management challenges of true knot of the umbilical cord. *Int J Womens Health* 2020;12:221-233.
6. Proctor LK, Fitzgerald B, Whittle WL, et al. Umbilical cord diameter percentile curves and their correlation to birth weight and placental pathology. *Placenta* 2013;34:62-6.
7. Liston R, Sawchuck D, Young D; Society of Obstetrics and Gynaecologists of Canada. British Columbia Perinatal Health Program. Fetal health surveillance: antepartum and intrapartum consensus guideline. [published erratum in *J Obstet Gynaecol Can* 2007;29:909] *J Obstet Gynaecol Can* 2007;29(Suppl 4):S3-56.
8. Daly LM, Gardener G, Bowring V, et al. Care of pregnant women with decreased fetal movements: update of a clinical practice guideline for Australia and New Zealand. *Aust N Z J Obstet Gynaecol* 2018;58:463-8.
9. Turner JM, Flenady V, Ellwood D, et al. Evaluation of pregnancy outcomes among women with decreased fetal movements. *JAMA Netw Open* 2021;4:e215071.
10. Thompson JMD, Wilson J, Bradford BF, et al. A better understanding of the association between maternal perception of foetal movements and late stillbirth — findings from an individual participant data meta-analysis. *BMC Med* 2021;19:267. doi: 10.1186/s12916-021-02140-z.

Competing interests: Orli Silverberg reports travel support from the University of Toronto. No other competing interests were declared.

This article has been peer reviewed.

The authors have obtained patient consent.

Affiliations: Department of Obstetrics and Gynaecology (Ferraro, Silverberg, Kingdom, Shirreff), University of Toronto; Department of Medicine (Ferraro, Silverberg), University of Toronto; Department of Obstetrics & Gynecology (Kingdom, Shirreff), Mount Sinai Hospital, Toronto, Ont.

Contributors: All of the authors contributed to the conception and design of the work. All of the authors drafted the manuscript, revised it critically for important intellectual content, gave final approval of the version to be published and agreed to be accountable for all aspects of the work.

Content licence: This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY-NC-ND 4.0) licence, which permits use, distribution and reproduction in any medium, provided that the original publication is properly cited, the use is noncommercial (i.e., research or educational use), and no modifications or adaptations are made. See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>

Correspondence to: Lindsay Shirreff, Lindsay.Shirreff@sinahealth.ca

The section Cases presents brief case reports that convey clear, practical lessons. Preference is given to common presentations of important rare conditions, and important unusual presentations of common problems. Articles start with a case presentation (500 words maximum), and a discussion of the underlying condition follows (1000 words maximum). Visual elements (e.g., tables of the differential diagnosis, clinical features or diagnostic approach) are encouraged. Consent from patients for publication of their story is a necessity. See information for authors at www.cmaj.ca.