CASE REPORT

Umbilical cord ulceration causing foetal haemorrhage and stillbirth

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We report a case of umbilical cord ulceration associated with obstruction of the duodeno-jejunal junction by a peritoneal band. Umbilical cord ulceration is a rare condition; a literature review identified a total of 17 cases only. In all cases, the ulceration was associated with congenital intestinal obstruction. Cord ulceration usually presents as sudden foetal deterioration due to foetal haemorrhage. This condition is associated with high perinatal mortality and morbidity. The causes of this condition are still unknown, and prenatal diagnosis is difficult. Awareness of the possible association between umbilical cord ulceration and intestinal obstruction, and of the need to deliver such pregnancies immediately when an abnormal foetal heart rate pattern develops might be the only means of preventing intrauterine death and improving neonatal outcomes.

Case report

A 25-year-old nulliparous woman was referred to our unit in October 2005 for suspected foetal duodenal atresia at 26 weeks of gestation. Her medical, surgical, and social histories were unremarkable. Her early antenatal course, managed by a private specialist, was uncomplicated. At 26 weeks' gestation, dilatation of the foetal stomach and duodenum were detected by ultrasound examination and the amniotic fluid index (AFI) was measured as 22 cm. It was suspected that the foetus had an obstruction at the duodeno-jejunal junction or jejunal atresia. An ultrasound scan performed at 29 weeks had similar findings, and the AFI was 28.4 cm. The polyhydramnios did not cause any maternal symptoms. At 31 weeks of gestation she presented to the hospital with a vaginal 'show', followed by rupture of the membranes and preterm labour. There was no sign of intrauterine infection. The cardiotocogram showed a reactive pattern. Steroids and tocolytics were administered and she was managed in the delivery suite with continuous foetal heart monitoring. Her blood pressure and pulse remained normal and the uterine contractions gradually subsided but 17 hours after commencing tocolytics and steroids, foetal bradycardia developed suddenly. The rate dropped to 60 beats per minute, lasting for 5 minutes. There was no abdominal pain or vaginal bleeding. An emergency caesarean section was performed and the amniotic fluid was seen to be heavily blood-stained. A 1.5-kg stillborn female was delivered 12 minutes after the decision to operate. The baby was pale at birth and failed to respond to cardiopulmonary resuscitation by the paediatrician. The placenta was normal on gross examination and there was no retroplacental clot. Examination of the umbilical cord revealed a 2-mm ulcer 1.5 cm from the foetal abdominal wall (Fig a, b).

Key words
Duodenal obstruction; Intestinal atresia; Ulcer; Umbilical cord

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Pathological findings

The placenta weighed 301 g with an eccentrically inserted three-vessel umbilical cord measuring 24 cm in length and 1 cm in diameter. There was no histopathology suggestive of placental abruption. The umbilical cord had areas of apparent surface erosion. A cross-sectional examination revealed that the umbilical arteries were closely applied to the surface of the cord with erosion and ulceration. A microscopic examination showed deficiency of the muscular wall with degeneration of the smooth muscle cells in the umbilical cord artery, especially on the side adjacent to the surface of the cord (Fig c). Areas of ulceration on the vessel wall were noted, and serial sections revealed blood clots associated with the defect.

At autopsy, the foetal parameters corresponded to gestational age. The entire segment of duodenum was markedly dilated due to extrinsic obstruction by a peritoneal band across the duodenal-jejunal junction. The other internal organs were unremarkable. Chromosomal studies of the placental tissue revealed a normal karyotype, 46,XX.

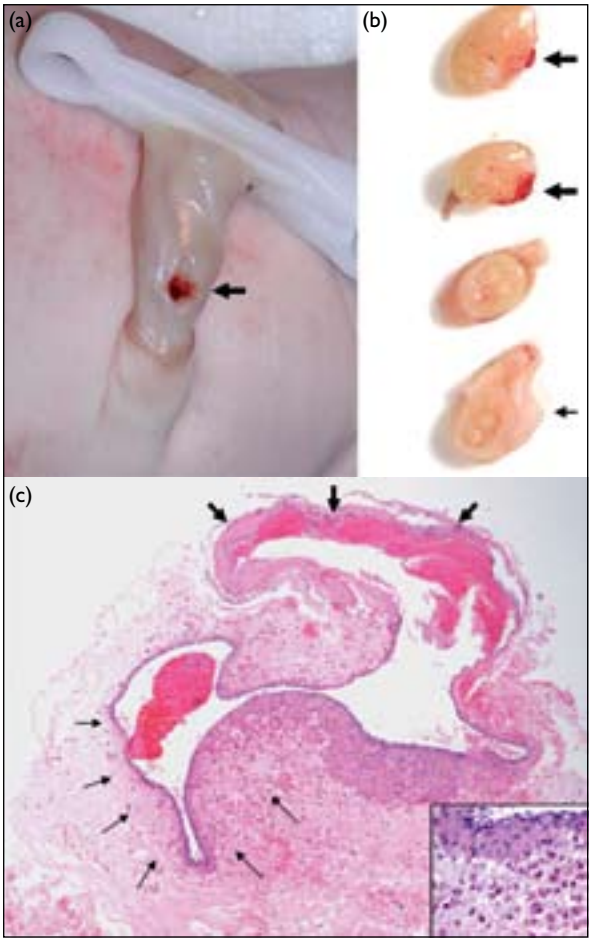

FIG. Umbilical ulceration is evident
(a) A 2-mm ulceration accompanied by haemorrhage is detected on the external examination of the umbilical cord. (b) Serial cross-sections demonstrate the umbilical cord ulceration and the association with the bleeding umbilical vessel (large arrows); the abdominal skin is indicated by the small arrow. (c) Histological section of the umbilical cord. There is a marked deficiency of Wharton's jelly and the umbilical artery is in close proximity to the surface of the umbilical cord in multiple sites. The histological picture corresponds to the ulceration site in (a). The amnion and Wharton's jelly are lost. The umbilical artery has ruptured through the umbilical cord surface and fresh thrombus is evident (large arrows). Loss and degeneration of smooth muscle cells of the vascular muscular wall is also seen (inset) and these have resulted in marked deficiency and thinning of the vessel wall (small arrows) [H&E, ×100 in original magnification; inset - H&E, × 400 in original magnification]

臍帶潰瘍引致胎兒出血及死亡

本病例報告描述一個胎兒的十二指腸與空腸交接處因一條腹膜帶以致梗阻，結果引起臍帶潰瘍。臍帶潰瘍非常罕見，文獻回顧只有17宗病例，而且全部和先天性腸梗阻有關。臍帶潰瘍的病徵通常是胎兒出血引致胎兒突然退化。該症與圍產期死亡率和發病率俱高有關，但成因至今未明，而且亦很難在產前診斷中發現。要防止胎兒宮內死亡，並提升胎兒存活的機會，目前唯一方法是及早留意腸梗阻是否與臍帶潰瘍有關，並在發現胎兒心跳出現異常時，考慮是否需要立即替孕婦接生。

Discussion

Umbilical cord ulceration and foetal haemorrhage related to congenital intestinal atresia were first reported by Bendon et al in 1991.[1] Since then, a total of 17 similar pregnancies have been reported in the English literature.[2-8] The incidence of this condition may be underestimated as umbilical cord ulceration without foetal haemorrhage may have been missed. The ulcers are usually small; in one report the ulcer was even not detectable macroscopically.[5] The outcome of these pregnancies, including our case, is usually poor; with five (27.8%) stillbirths and four (22.2%) early neonatal deaths. Among the nine survivors, four suffered from ischaemic injury to the brain or hypoxic-ischaemic injury to the kidneys and one of them died at 10 months (Table). All the women presented after 30 weeks of gestation. The usual presentation is rupture of the membranes or preterm labour with sudden foetal bradycardia, with or without blood-stained liquor before delivery. In most pregnancies, the foetal bradycardia occurred hours or even days after commencement of preterm labour, rupture of the membranes or amniocentesis. A strikingly consistent finding was that all foetuses were subsequently found to have bowel obstructions, usually the small bowel.

Three possible mechanisms have been proposed for the development of umbilical cord ulceration in the presence of gastro-intestinal obstruction: (i) vascular reactivity leading to ischaemic changes over the umbilical cord, (ii) gastric or duodenal content reflux initiating ulcer formation, and (iii) a primary epithelial abnormality producing both intestinal atresia and cord ulcers.[1] Our case demonstrated an association between the umbilical ulcer and extrinsic compression of the bowel by a peritoneal band rather than intrinsic intestinal atresia. This made the hypothesis of a primary epithelial abnormality causing the umbilical cord ulcer less likely. The hypothesis concerning vascular reactivity is based on evidence of the ischaemic origin of congenital intestinal atresia.[9] The umbilical cord arteries have also been shown to maintain prolonged vascular spasm after delivery.[10] It has been proposed that an artery may go into spasm in utero, causing an ischaemic ulcer of the umbilical cord but this remains speculative. Intestinal atresia might produce reflux of the gastric or duodenal contents that could initiate an ulcer. This hypothesis has been supported by evidence of haemosiderin-negative or non-iron stain, green-brown pigment laden macrophages in the amnion, chorion, and umbilical cord[1,3,5]; and the observation of increased amniotic fluid optical density (450 nm) in a case of duodenal atresia.[11] So far, all reported cases with

TABLE. Reported cases of umbilical cord ulceration, intestinal atresias and foetal haemorrhage*

Reference	Case No.	Anomalies	Detected gestational age (years)	Presentation	MOD	Weight (g)	Outcome
1	1	DA	31	Preterm labour BSL on ARM Foetal bradycardia	CS	1830	Alive
1	2	JA VSD, AS, TR	34	PPROM BSL on amniocentesis Foetal bradycardia	CS	2020	Alive
1	3	DA	30	Preterm labour Sudden undetectable foetal HR and found stillbirth	NVD	1700	Stillbirth
2	4	MA, Hirschsprung's disease	32	Preterm labour Foetal bradycardia ARM with BSL	NVD	1630	Asphyxia, died at 10 months of age
3	5	DA	35	PPROM Amniocentesis Foetal deceleration 1 day later	CS	2500	Died on day 6
4	6	JA	32	PPROM Foetal bradycardia 5 days later	CS	1998	Died on day 0
4	7	JA	33	BSL Foetal distress	CS	1580	Alive, asphyxia
4	8	DA	35	BSL Foetal distress	NVD	2366	Stillbirth
4	9	DA	36	BSL Foetal distress	NVD	2444	Stillbirth
4	10	DA, VSD, right hydropelvis	34	BSL Foetal distress	CS	1826	Alive
4	11	JA	37	BSL Foetal distress	CS	2366	Died on day 0
5	12	DA	34	Preterm labour Foetal deceleration 1 day later and amniocentesis with BSL	CS	1934	Alive
5	13	JA	32	Preterm labour Foetal bradycardia 1 day later	CS	2050	Alive, hypoxic injury to kidneys
6	14	JA	35	Preterm labour Foetal deceleration	CS	1934	Alive
6	15	JA	32	PPROM Foetal bradycardia 1 day later	CS	2200	Alive, hypoxic injury to kidneys
7	16	DA	36	Undetectable foetal HR	NA	2484	Stillbirth
8	17	DA Left isomerism of bilateral lung, visceral inversion	35	Preterm labour Amnioreduction Foetal bradycardia 5 days later	CS	2675	Died on day 0
Present case	18	JA (Peritoneal band)	31	PPROM and preterm labour Foetal bradycardia 17 hours later	CS	1500	Stillbirth

* ARM denotes artificial rupture of membranes; AS aortic stenosis; BSL blood-stained liquor; CS caesarean section; DA duodenal atresia; HR heart rate; JA jejunal atresia; MA multiple intestinal atresia; MOD mode of delivery; NA not available; NVD normal vaginal delivery; PPROM preterm prelabour rupture of membranes; TR tricuspid insufficiency; and VSD ventricular septal defect

umbilical cord ulcers have been associated with intestinal obstruction at or distal to the duodenum and there has been no reported case of oesophageal atresia (Table). This concurs with the hypothesis that gastric contents reflux is the cause of the umbilical cord ulcer and hence the intrauterine haemorrhage.

In most reported cases, intestinal atresia was not diagnosed antenatally. Umbilical cord ulceration was not suspected in any of them. It is not clear whether the assessment of total bile acid concentrations in the amniotic fluid would have helped detect those at high risk of cord ulceration and haemorrhage. This could be performed in women requiring therapeutic drainage of amniotic fluid in order to gain more information and to enable correlation with umbilical cord pathology after delivery. Theoretically, delivering the foetus before severe haemorrhage occurs is the ideal management but this is not easy to achieve. The ulcers are small; some may not be visible macroscopically. Also, detection of

those at high risk using a sonographic assessment of loss of Wharton's jelly along the entire length of the umbilical cord is technically not possible. Being aware of this condition and performing immediate delivery of any foetus with heart rate abnormalities is currently the only method of preventing intrauterine death.

In summary, umbilical cord ulceration is a rare condition associated with intestinal obstruction. The foetal outcome is poor and intensive monitoring is advised in women known to have foetal intestinal obstruction presenting with rupture of the membranes or preterm labour. Knowledge of such an association and immediate delivery of a foetus with heart rate abnormalities might be the only method of preventing intrauterine death and improving neonatal outcomes.

References

1. Bendon RW, Tyson RW, Baldwin VJ, Cashner KA, Mimouni F, Miodovnik M. Umbilical cord ulceration and intestinal atresia: a new association? Am J Obstet Gynecol 1991;164:582-6.
2. Khong TY, Ford WD, Haan EA. Umbilical cord ulceration in association with intestinal atresia in a child with deletion 13q and Hirschsprung's disease. Arch Dis Child Fetal Neonatal Ed 1994;71:F212-3.
3. Khurana A, Huettner PC, Cole FS. Umbilical cord ulceration as a cause of hypoxic-ischemic encephalopathy: report of a case and review of the literature. J Perinatol 1995;15:423-5.
4. Ohyama M, Itani Y, Yamanaka M, et al. Umbilical cord ulcer: a serious in utero complication of intestinal atresia. Placenta 2000;21:432-5.
5. Shimizu S, Kawagishi R, Arimoto-Ishida E, Wada K, Shimoya K, Murata Y. Fetal hemorrhage associated with congenital intestinal atresia. J Obstet Gynaecol Res 2003;29:312-6.
6. Kimura T, Usui N, Kamata S, et al. Umbilical cord ulcer associated with fetal jejunal atresia: report of 2 cases. Fetal Diagn Ther 2003;18:144-7.
7. Anami A, Morokuma S, Tsukimori K, et al. Sudden fetal death associated with both duodenal atresia and umbilical cord ulcer: a case and review. Am J Perinatol 2006;23:183-8.
8. Hidaka N, Chiba Y. Intrauterine hemorrhage from an umbilical cord ulcer associated with fetal duodenal atresia: a case report. Arch Gynecol Obstet 2007;275:219-22.
9. Tibboel D, van Nie CJ, Molenaar JC. The effects of temporary general hypoxia and local ischemia on the development of the intestines: an experimental study. J Pediatr Surg 1980;15:57-62.
10. White RP. Pharmacodynamic study of maturation and closure of human umbilical arteries. Am J Obstet Gynecol 1989;160:229-37.
11. Sankaran K, Sheridan M, Singh M, Singh Cheema G, Laxdal VA. Abnormal amniotic fluid spectrophotometry in a pregnancy associated with fetal duodenal atresia. Am J Obstet Gynecol 1984;148:1140-1.