CASE REPORT

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A fetus with an immature umbilical cord teratoma associated with exomphalos: case report and review of the literature

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Abstract

Objective: To describe the antenatal and pathological features of an immature umbilical cord teratoma associated with exomphalos, and to review the literature on this subject. *Case presentation*: An abdominal wall defect, suspected to be an exomphalos, was identified during routine ultrasound examination performed at 13 weeks of gestation. The pregnancy was terminated. Fetopathological examination revealed an immature umbilical cord teratoma associated with exomphalos. Chromosomal microarray analysis was normal. *Conclusions*: Umbilical cord teratomas, albeit very rare, should be emphasized as a possible differential diagnosis when abdominal wall defects are detected. Since cord teratomas may lead to adverse fetal or neonatal outcomes, close follow-up of the fetus is recommended.

Keywords: congenital defects, exomphalos, prenatal diagnosis, teratoma, ultrasonography, umbilical cord.

Introduction

Umbilical cord tumors are rare and, among them, teratomas, which are accepted as the only true neoplasms in this location, are extremely rare [1]. Umbilical cord teratomas are histologically composed of tissues from all three germ-cell layers [2]. Although they can be suspected antenatally by ultrasound because they contain both cystic and solid areas, the diagnosis is challenging due to their rarity, pleomorphic presentation, and broad differential diagnosis [3]. To the best of our knowledge, only 18 cases of umbilical cord teratomas are reported in the literature, six of which associated with exomphalos [3–8]. Other rarer structural abnormalities were reported in a few cases [7–12], and one fetus was shown to have trisomy 13 [5]. The gestational age at presentation varies from 12 weeks to term, and the fetal and neonatal outcome can be poor [8, 9, 12–15].

Aim

We report the case of an immature teratoma of the umbilical cord. This is the nineteenth case of a teratoma in this location, the seventh associated with exomphalos, and the first in which chromosomal microarray analysis was performed. An abdominal wall defect was first detected at 13 weeks of gestation, but the only suspected diagnosis on ultrasound was exomphalos, suggesting that the detection of an exomphalos may hide other diagnoses, and that abdominal wall defects should be examined with the diagnosis of umbilical cord teratoma in mind. We also discuss the differential diagnosis of this condition and review the literature on this subject. Our case highlights the challenges in the diagnosis of umbilical cord teratomas in particular and abdominal wall defects in general.

Case presentation

A 35-year-old pregnant woman with no relevant medical history was referred to the Obstetrics Department of our Hospital at 15 weeks gestation because of suspected exomphalos and anterior, posterior and inferior placental abruption detected in a three-dimensional (3D) ultrasound examination performed at 13 weeks gestation. She was gravida 3, para 1, reporting an uncomplicated pregnancy two years earlier and a first trimester miscarriage. There was no history of chromosomal abnormalities or congenital malformations in either hers or her husband's family, and the remaining family history was unremarkable. Ultrasound examination at nine weeks gestation had been considered normal.

3D ultrasound examination was performed at our Hospital at 15 weeks gestation revealing a mass with 38×28 mm arising from an anterior abdominal defect located to the right of the umbilical cord through which intestinal loops were herniated (Figure 1). Although it appeared the bowel loops were covered by membranes, this abdominal defect

did not easily fall within the definition of an omphalocele because it was not central. No other malformations were detected in the fetus. In retrospect, acoustic shadows could be observed, indicating the presence of bone within the umbilical cord lesion. Subsequent ultrasound examinations confirmed the original observations and demonstrated stability in the dimensions of the mass.

The couple was referred for genetic counseling and etiological investigation, and invasive prenatal testing was decided. Array-based comparative genomic hybridization (array-CGH; CGX-HD 37K prenatal filter, Perkin Elmer) was performed after deoxyribonucleic acid (DNA) extraction from amniocytes, and was normal: arr(1-22,X)x2.

The couple opted for termination of pregnancy, which occurred at 20 weeks and two days of gestation.

Macroscopically, the placenta was intact, ovoid, and normal in appearance, measuring 12×11×2.2 cm and weighing 128 g. Fetal and maternal surfaces were both unremarkable, and membranes were normal. The umbilical cord was centrally inserted, contained one vein and two arteries throughout its entire length, and was covered by amniotic epithelium. Histologically, the placental architecture was maintained and adequate for gestational age, with no significant pathological alterations either in the trophoblast and other cellular components or in the maternal blood space and fetal capillaries.

The fetus had female genitalia, weighed 305 g, and measured 23.5 cm. On external examination, a continuity solution with 2×1.5 cm was observed in the abdominal wall. It was associated with an exomphalos measuring 6.5×6×3 cm, which contained most fetal intestinal loops. A lobulated mass with 6×5×5.3 cm, composed by both soft white areas and petrous greyish brown areas, and covered either by a thin transparent membrane or by skin, arose from the wall of the exomphalos. No dysmorphisms or other external malformations were observed (Figure 2).

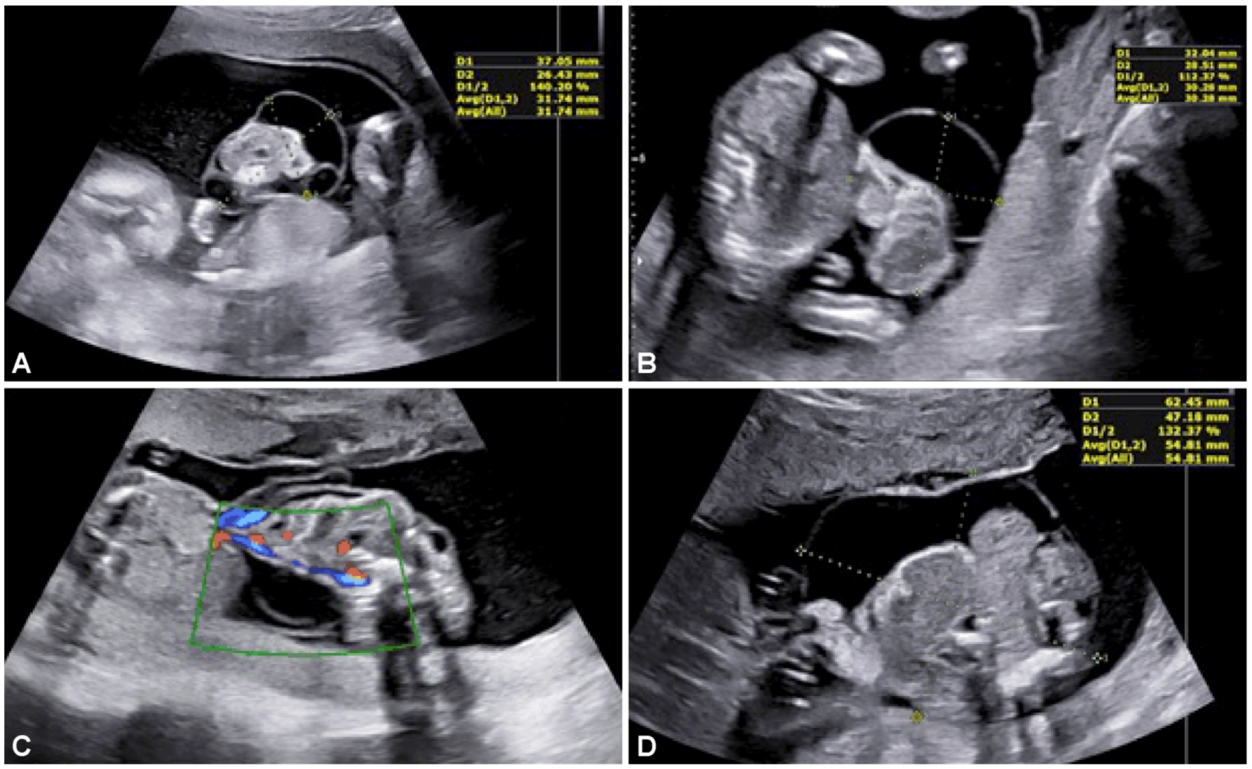

Figure 1 – ***Ultrasound images at 15 weeks and one day (A), 15 weeks and five days (B), 17 weeks (C) and 20 weeks (D) showing exomphalos and acoustic shadowing, which was recognized retrospectively to be due to the bone component of a teratoma.***

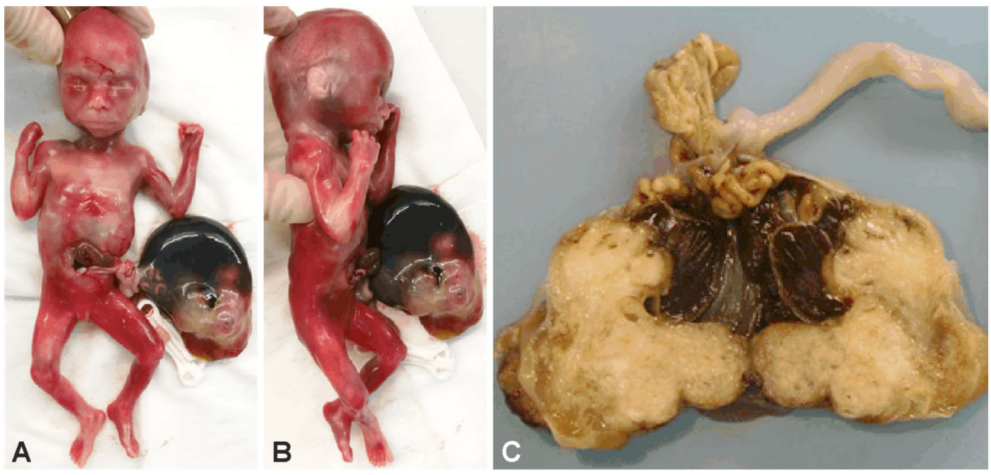

Figure 2 – ***Macroscopic examination of the fetus with the umbilical cord. A mass arising from the wall of an exomphalos is observed (A and B). A section of the mass is also shown (C).***

On internal examination, apart from the intestinal exteriorization, the form, size, and topography of the organs were normal. Histologically, the previously described mass had tissues of all three germinal layers, including skin with dermal appendages, epithelia of intestinal type, glial tissue, bone, cartilage, ependyma, and neuroepithelial tubules; there were no whole organs or areas of malignant tissue. Based on these features, a diagnosis of benign, immature teratoma, grade II, was established (Figure 3). The histology of the fetal organs, bowel included, was normal.

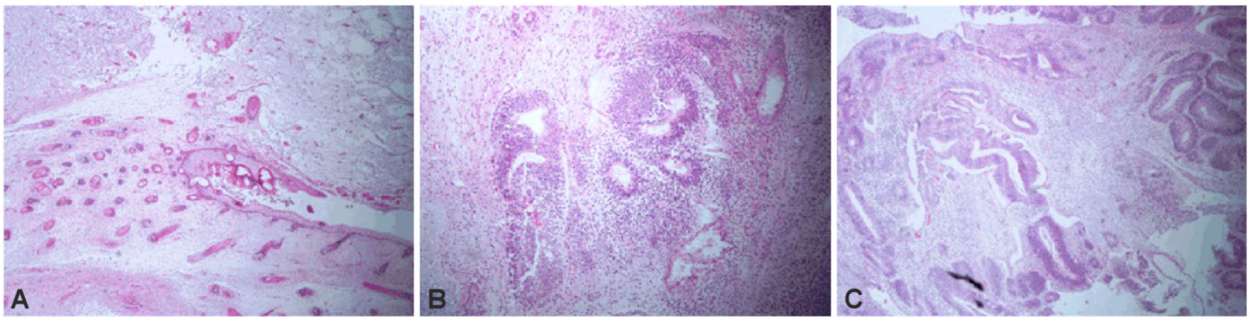

Figure 3 – ***Histological sections showing dermal appendages, epithelia of the intestinal type, connective, glial and neuro-epithelial tissues, bone, cartilage, ependyma, and neuroepithelial tubules, compatible with an immature umbilical cord teratoma (HE staining, ×400).***

According to previously described cases, the empiric recurrence risk for umbilical cord teratoma and exomphalos is low.

Discussions

Teratomas are the most frequent congenital tumors [5]. They are germ cell tumors commonly composed of multiple cell types originating from one or more of the three germinal layers and derived from pluri or totipotent embryonic cells with diploid chromosome sets [3]. They are often located in the gonads, and their occurrence in extragonadal sites is rare [16]. Teratomas of the umbilical cord in particular are extremely rare [11].

In fact, solid tumors of the umbilical cord are generally rare [7]. Although there are other pseudotumoral and tumoral masses that can develop in the umbilical cord, teratomas are the only true neoplasms occurring in this location [7].

A literature search was conducted, with no language or date restrictions, and yielded 18 previously reported cases of umbilical teratomas going back to the late nineteenth century up to the present days. All but one case reported until the nineties were diagnosed only at birth (nine cases), while all but one case identified thereafter were diagnosed prenatally (seven cases) at varying ages of gestation, ranging from 12 to 20 weeks (Table 1).

Table 1 – ***Previously reported cases of umbilical cord teratomas***

Reference	Associated abnormalities	Gender	Presentation	Outcome
Budin (1878) [17]	None	F	Birth	AW
Haendly (1923) [9]	Umbilical hernia	Unknown	Birth	Postoperative death
Hartz & van der Sar (1945) [14]	Liver teratoma	F	Birth	Postoperative death at four months
Kreyberg (1958) [15]	None	F	Birth	Stillbirth
Fujikura & Wellings (1964) [12]	Hydrocephalus, myelomeningocele, right kidney aplasia, absence of right upper and lower limbs	M	Birth	Death at one month
Heckmann *et al.* (1972) [18]	Single umbilical artery	F	Birth	AW
Smith & Majmudar (1985) [11]	Bladder exstrophy	F	Birth	Unknown
Bersch *et al.* (1985) [19]	None	Unknown	Birth	AW
Wagner *et al.* (1993) [10]	Hypotrophy	F	Birth	AW
Kreczy *et al.* (1994) [3]	Exomphalos	F	20 weeks	AW
Satgé *et al.* (2001) [4]	Exomphalos	M	12 weeks	Termination of pregnancy
Hargitai *et al.* (2005) [5]	Exomphalos	F	16 weeks	Termination of pregnancy
Del Sordo *et al.* (2006) [20]	None	F	Birth	Unknown
Keene *et al.* (2012) [6]	Exomphalos	F	20 weeks	AW
Crahes *et al.* (2013) [7]	Atrioventricular septal defect, exomphalos, intestinal malrotation and duplication	F	18 weeks	AW
Chavali *et al.* (2014) [8]	Exomphalos, duodenal atresia	F	20 weeks	Postoperative death at four days
Demir *et al.* (2014) [13]	None	F	15 weeks	Stillbirth at 25 weeks
Van Keirsbilck *et al.* (2016) [21]	None	F	13 weeks	AW

AW: Alive and well; F: Female; M: Male.

Ten (56%) cases had associated structural abnormalities [3–12]; exomphalos was observed in six (33%) cases and was the most common [3–8]. One of the fetuses presenting with exomphalos had trisomy 13 [5]. Conventional karyotyping was performed in two other cases and found to be normal [7, 13]. Rarer structural abnormalities, confined to the abdomen in all but three cases, were hypotrophy, umbilical hernia, intestinal malrotation and duplication, duodenal atresia, absence of the right kidney, bladder exstrophy, absence of the right upper and lower limbs, atrioventricular septal defect, and hydrocephalus and myelomeningocele [7–12]. Fourteen cases were female [3, 5–8, 10, 11, 13–15, 17, 18, 20, 21], only two were male [4, 11], and gender was not mentioned in the three remainder [9, 19].

Histologically, these tumors were frequently covered by skin and included components derived from the three germinal layers; adipose tissue, connective tissue, smooth muscle, nervous tissue, glial tissue, gland-like structures, as well as cysts covered by squamous or columnar lining, were the most frequent histological structures observed [3–5, 8, 11–13, 21]. Only five (28%) cases contained immature tissue [6, 8, 10, 13, 21]. No gross malformations of the placenta were reported.

Almost no obstetric complications were reported. However, six cases resulted in stillbirth or early death, mainly perioperative, revealing a poor prognosis in a significant number of cases [8, 9, 12–15]. As for the others, the outcome is not mentioned in two cases [11, 20], termination of pregnancy occurred in two cases [4, 5], and eight cases are described as alive and well [3, 6, 7, 10, 17–19, 21].

Our literature review also shows that teratomas vary in size, grow rapidly, have a very polymorphic presentation, and occur along the whole length of the umbilical cord [3–14, 17–21]. Prognosis is largely determined by the presence of associated anomalies and the occurrence of surgical complications; conversely, the presence of immature tissue does not appear to have any bearing on prognosis [8].

Our case shares some similarity with previously reported cases. It corresponds to an immature teratoma, the only associated malformation is exomphalos, and it was prenatally diagnosed in a female fetus with no chromosomal anomalies.

Prenatal diagnosis of umbilical cord teratomas is challenging, especially when exomphalos is also present. However, these neoplasms should be suspected when a mixed solid and cystic mass is documented attached to the umbilical cord in the midline and, in the presence of exomphalos, when narrowing of the umbilical cord between the mass and the abdominal wall is observed [4, 5]. In the present case, the ultrasonographic features precluded the diagnosis of umbilical cord teratoma. However, acoustic shadowing indicating the presence of bone, together with the narrowing of the umbilical cord between the lesion and the abdominal wall, could in retrospect have suggested a tumoral mass.

Given that fetal demise occurs in some cases of umbilical cord teratoma, close follow-up of these cases is recommended to monitor mass size, local vascular effects, and systemic implications on the fetus wellbeing, including heart failure. In addition, although umbilical cord teratomas are usually considered to be benign and primitive, a report describing two teratomatous masses in a child suggests this might not always be true [14].

Conclusions

This case shows that the differential diagnosis of an abdominal wall defect should include umbilical cord teratoma. The accuracy of ultrasonography in the diagnosis of abdominal wall defects is high, nonetheless it demands great expertise and special attention to detect this type of tumor. This case is relevant because umbilical cord teratomas associated with exomphalos are extremely rare and difficult to diagnose antenatally. Abnormalities were first detected at 13 weeks gestation, making this one of the earliest umbilical cord teratomas ever reported. Array-CGH had never been performed in a similar case. It is possible that umbilical cord teratomas are not as rare as initially thought. After the diagnosis of an abdominal wall defect, the fetus, the placenta, and the umbilical cord should be carefully examined, so that teratomas are not overlooked on ultrasound examination.

Conflict of interests

None to declare.

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