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Case Report

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Ultrasound features of placental chorioangioma detected by SMI technology before and after thrombosis of feeding vessels: analysis of a clinical case

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Abstract

Objective: Placental chorioangioma is the most common non-trophoblastic vascular benign tumor of the placenta, with an estimated incidence of 1% of all pregnancies. Most chorioangiomas are small asymptomatic lesions that are found incidentally only postnatally during histologic examination of the placenta. Voluminous chorioangiomas (>4–5 cm), however, are less common and are more often diagnosed prenatally, through ultrasound imaging. Color Doppler demonstrates either a single blood vessel feeding the lesion or substantial vascularity within the mass. Large tumors have been associated with multiple adverse perinatal outcomes, including fetal growth restriction, preterm birth, polyhydramnios, fetal congestive heart failure, fetal anemia, fetal hydrops and intrauterine death.

Case: A 35-years-old primigravida woman with uncomplicated pregnancy was referred to the Ultrasound Centre of Obstetric and Gynecologic of Sant'Anna Hospital, Turin, due to a suspect placental mass seen during the ultrasound performed at 32 weeks of gestation. In this case, detailed ultrasound scans with grey scale and Doppler examination were performed (using Aplio 550; Canon Medical Systems Europe BV, Zoetermeer, The Netherlands). We also decided to study the vascularization of the mass with SMI (superb microvascular imaging) technology. In particular, with the use of SMI, it was possible to visualize the vascularization of the mass more completely which was conspicuous at first but disappeared after thrombosis of feeding vessels with favorable pregnancy outcome.

Conclusion: SMI is a new vascularity imaging method that can visualize vessels that exhibit slow flow rates. It uses a system to reduce artifacts by greatly reducing interference from tissue movement.

Keywords: Placenta, ultrasound, chorioangioma, color Doppler, SMI.

Introduction

Placental chorioangioma is the most common non-trophoblastic vascular benign tumor of the placenta, with an estimated incidence of 1% of all pregnancies.[1–3] Its prenatal diagnosis relies on the visualization of a rounded well-circumscribed mass arising from the fetal surface of the placenta.[1,4]

Most chorioangiomas are small asymptomatic lesions that are found incidentally only postnatally during histologic examination of the placenta.[3–5]

Voluminous chorioangiomas (>4–5 cm) are less common with a prevalence ranging from 1 in 3500 to 1 in 9000–16,000 births. They are more often diagnosed prenatally, through ultrasound imaging. Usually they are observed as a well-defined solid mass protruding into

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the amniotic cavity.[2–5] Color Doppler demonstrates either a single blood vessel feeding the lesion or substantial vascularity within the mass.[3,4]

Large tumors have been associated with multiple adverse perinatal outcomes, including fetal growth restriction, preterm birth, polyhydramnios, fetal congestive heart failure, fetal anemia, fetal hydrops and intrauterine death.[1–4]

Although tumor size seems to be the most important prenatal prognostic factor, the vascularity may be an independent factor of fetal complications.[3]

Studies demonstrate large avascular tumors to be associated with uncomplicated pregnancies and at term deliveries,[2,3,5–7] while fetal and neonatal complications are reported in pregnancies with chorioangiomas with permanent vascularization, even if they are small.[3,7]

Color Doppler imaging has also shown cases of decreased intra tumoral vascularity associated with the development of calcifications;[4,6] spontaneous thrombosis and infarction of the feeding vessels and subsequent calcifications seems to be a favorable prognostic factor, which reduces the potential risk of fetal complications.[4,6,7] A case of regression of fetal hydrops after spontaneous infarction of placental chorioangioma has also been described with positive fetal, neonatal and maternal outcomes.[8]

Even if the tumor size remains an important prognostic factor, intense vascularization and tumor site close to umbilical cord insertion are independent factors indicative of poor pregnancy outcome.[3] For this reason, we decided to study chorioangioma using different imaging methods to represent vascularization and in particular superb microflow imaging (SMI). SMI is a new vascularity imaging method that can visualize vessels that exhibit slow flow rates. Through reducing interference from tissue movement, it can significantly reduce artifacts.

Case

A 35-years-old primigravida woman with uncomplicated pregnancy was referred to the Ultrasound Centre of Obstetric and Gynecologic of Sant'Anna Hospital, Turin, due to a suspect placental mass seen during the ultrasound performed at 32 weeks of gestation.

A detailed ultrasound scan with grayscale and Doppler examination was performed (using Aplio 550; Canon Medical Systems Europe BV, Zoetermeer, The Netherlands). It showed a single living fetus with appropriate growth for gestational age and regular anatomical development assessment. Doppler blood flow of the umbilical artery and the middle cerebral artery was unremarkable. The amniotic fluid amount was within normal range. A rounded well-circumscribed mass, measuring 64×53×63 mm, was observed raising from the fetal surface of placenta near the umbilical cord insertion and protruding into the amniotic cavity. The mass was solid and homogeneously hypoechoic, without images referable to areas of calcification or necrosis (**Fig. 1**). The visualization and the study of the vascularization of the mass were performed with the use of different types of Doppler (conventional color Doppler, advanced Doppler flow [ADF] and SMI). In particular, with the use of SMI, it was possible to obtain a more complete visualization of the mass vascularization, which was conspicuous. Elevated vascularity was shown either at the periphery and within the placental lesion (**Figs. 2** and **3**).

Stimulation of fetal pulmonary maturation and maternal intravenous iron injection were organized during day hospital appointments because of maternal anemia (blood hemoglobin 8 g/dl) discovered from scheduled exams.

Fig. 1. Homogeneously hypoechoic solid type placental mass, without images referable to areas of calcification or necrosis.

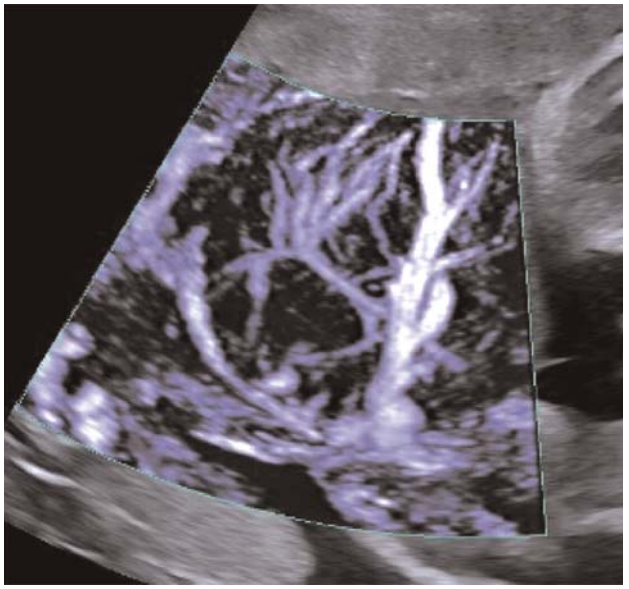

Fig. 2. Sagittal section of chorioangioma: the use of SMI showed elevated vascularity either at the periphery or within the placental mass.

Several ultrasound checks were arranged. Doppler blood flow assessment of the umbilical artery and the middle cerebral artery was performed and no variation occurred. Fetal measures showed regular growth and no sign of fetal congestive heart failure was detected.

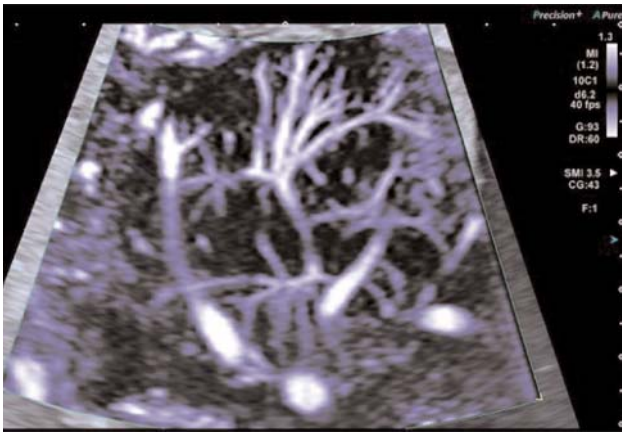

Fig. 3. Coronal section of chorioangioma: SMI techinique highlighted the intense vascularity of the placental mass with its ramifications.

During the ultrasound follow-up at 34 weeks and 4 days of gestation, a change in the echo-structure of the mass was observed. Structural inhomogeneity appeared, with the presence of lines and the development of coarse echogenic sediments, the mass also completely lost its vascularity (**Figs. 4** and **5**).

Fig. 4. Grayscale examination showed a change in the echo-structure of the placental mass because of the appearance of structural inhomogeneity, with presence of lines and the development of coarse echogenic sediments.

Fig. 5. SMI examination showed complete loss of placental mass vascularity.

The ultrasound scans were scheduled every other day. At 35 weeks and 4 days of gestation, another lesion on the fetal surface of placenta, measuring 35×27 mm, with no vascularity inside, was seen. It seemed to be a placental hematoma and was located near the umbilical cord insertion, on the opposite side of the chorioangioma. Following this finding, it was decided to anticipate delivery by cesarean section. The newborn female baby had both 1 and 5-minutes Apgar score of 9 and weighed 2700 g. Placenta weighed 800 g.

The pathologic examination of the placenta showed two chorioangiomas measuring 8 cm and 3.5 cm, respectively, with congestive and ischemic areas and thrombosis of feeding vessels (**Fig. 6**).

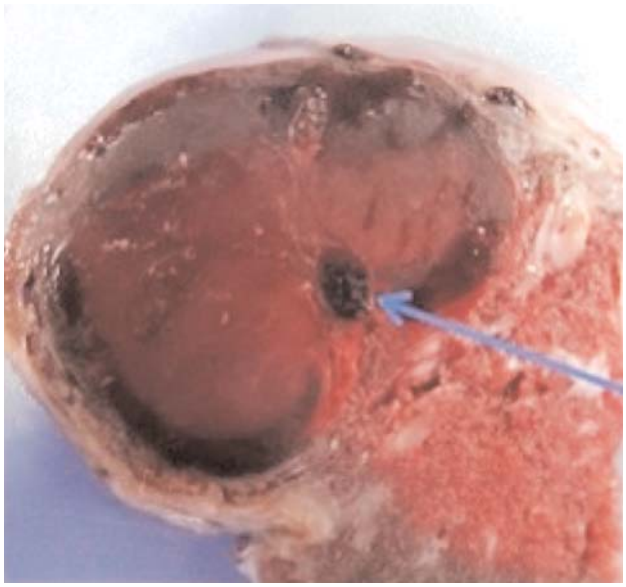

Fig. 6. Pathologic examination of the placenta with two chorioangiomas measuring 8 cm and 3.5 cm, respectively, with congestive and ischemic areas and thrombosis of feeding vessels.

Discussion

When placental masses are discovered during sonographic evaluation, grayscale sonography is the primary diagnostic tool. In 1994, Bromley and Benacerraf studied 10 solid placental masses with grayscale sonography and stated that the sonographic appearance of a chorioangioma was indistinguishable from that of a placental hemorrhage.[9]

Later, Sepulveda et al. demonstrated that, at the conventional bidimensional ultrasound, the texture of chorioangioma was similar to that of subchorionic thromboembolism and subamniotic hematoma; however, it was possible to identify feeding vessels in case of a chorioangioma.[10]

When a placental mass is found, either within the placental surface or protruding into the amniotic cavity, the demonstration of blood flow within the tumor contributes to the diagnosis of chorioangioma.[4,11,12] The use of color Doppler shows either substantial vascularity within placental mass or a single blood vessel feeding the lesion.[2,10] Pulsed Doppler study, obtained by sampling the vessels inside the tumor, can show flow velocity waveforms with a typical fetal pattern,[4,7,13] This confirms that the vascular channels in the tumor are continuous with the fetal circulation and, consequently, this rules out other diagnoses such as degenerated myoma, placental teratoma or incomplete hydatidiform mole.[4,11,13]

In above-mentioned literature, chorioangiomas were studied using conventional blood flow imaging methods such as color and power Doppler imaging.[14] In our case, we used different methodologies to study the vascularization, and we also evaluated placental chorioangioma applying SMI technology. This is the second report to describe vascularization of placental chorioangioma depicted using SMI. Previously, Mack et al.[15,16] applied SMI technology for placental chorioangioma investigation to enhance its micro-vascularization.

We found SMI a superior technique for the representation of chorioangioma vascularization. The ability of this tool to highlight even small vessels and with even low flow rate allowed a more complete ultrasound representation of the tumor vascularity. This technique contributed to periodic assessments of the level of vascularization, facilitating the comparison between the examinations carried out at different times.

In our case, we also observed a sudden change in ultrasound appearance of the mass, with the detection of the total absence of vascularization, also through the use of the SMI. Although avascular chorioangiomas on color Doppler imaging are described, the absence of blood flow in a placental mass should not be used to rule out the diagnosis of chorioangioma as a first hypothesis.[7,11] In our case, we had the opportunity to observe the transformation of the echo-structural appearance and vascular pattern of the tumor, due to a possible thrombosis of the feeding vessel. This was in

line with literature in which spontaneous thrombosis of chorioangiomas occurred in utero. When this happens, the tumor can mimic a subchorionic thrombohematoma and therefore no Color Doppler signal is farther displayed.[7] Our report is the first one that detected the absence of micro-vascularization using SMI technology, showing also the absence of low-velocity blood flow, not detected by conventional Doppler, after thrombosis of feeding vessels of chorioangioma. Similar results using SMI technology were obtained for the analysis of placental infarction from Hasegawa et al.[15] and Furuya et al.[17]

Doppler methods capable of highlighting the vascular tree of a mass in depth, such as SMI, can be very useful in a variety of clinical situations in which it is necessary to make use of techniques capable of highlighting the vessels in an easy and detailed way, with a high frame rate and with a reduction of artifacts.

According to literature, our case also demonstrates how the infarction of the feeding vessel of the tumor and the subsequent regression of chorioangioma vascularity are associated with favorable pregnancy outcomes, reducing the potential risk of fetal complications.

Conclusion

Despite the fact that the usefulness of different ultrasound methodologies to study vascularization in the differential diagnosis between chorioangioma and other placental lesions is clear, undetectable color flow signal within the tumor and so absence of blood flow within the mass cannot be used as a definitive proof to rule out the diagnosis of chorioangioma, unless previous ultrasound scans detected vascularization within the mass.

In conclusion, we have found that even though the placental vascularity can be assessed using several ultrasound imaging techniques, including color Doppler flow imaging, Power Doppler flow imaging and 3-dimensional power Doppler ultrasound, the SMI technology seems superior due to its simplicity and reproducibility, as well as due to the fact that it provides a clearer microvascular display and is more sensitive to low-velocity blood flow, making it the most advanced technique to date for detecting the placental microcirculation.

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