CASE REPORT

In Utero Sonographic Findings of Giant Hepatic Hemangioma and Associated Perinatal Complications: A Report of Two Cases

Hiromi Imai*, Nobuhiro Hidaka, Takeshi Murakami, Saki Kido, Yasuo Yumoto, Kotaro Fukushima, Kiyoko Kato

Department of Obstetrics and Gynecology, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan

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It is uncommon to diagnose fetal hepatic hemangioma during the antenatal period. We describe herein two patients with a giant hepatic hemangioma detected antenatally, both with perinatal complications. In Case 1, a fetal intra-abdominal mass, measuring 63 mm × 50 mm × 74 mm, was observed below the right lobe of the liver, and the presumptive antenatal diagnosis of hepatic hemangioma was made at 37 weeks of gestation. Antenatal imaging suggested an intratumoral hemorrhage, but postnatal clinical findings refuted this diagnosis. However, progressive thrombocytopenia and coagulopathy were noted just after birth, resulting in the diagnosis of Kasabach–Merritt syndrome. In Case 2, our ultrasound examination performed at 40 weeks of gestation revealed a mixed solid and cystic hepatic tumor, measuring 99 mm × 54 mm. Further, antenatal sonography revealed cardiomegaly, increased descending-aorta velocity, atrioventricular valvular regurgitation, and a dilated inferior vena cava, suggesting high-output cardiac insufficiency. Giant hepatic hemangiomas can lead to severe complications such as cardiac insufficiency and Kasabach–Merritt syndrome, and these complications may occur during the fetal or early neonatal period. Detailed prenatal evaluation using fetal imaging and cord-blood sampling is important to determine proper antenatal management of patients with giant hepatic hemangiomas and to allow for prompt postnatal treatment.

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* Correspondence to: Dr Hiromi Imai, Department of Obstetrics and Gynecology, Graduate School of Medical Sciences, Kyushu University, 3-1-1 Maidashi, Higashi-ku, Fukuoka 812-8582, Japan.

E-mail address: pinkymbmb1121@gmail.com (H. Imai).
Introduction

Hepatic tumors account for approximately 5% of childhood neoplasms [1]. Infantile hemangioma is the most common primary hepatic neoplasm, followed, in order, by mesenchymal hamartoma and hepatoblastoma [2]. Small hepatic hemangiomas are usually asymptomatic and seldom require therapy. Giant hepatic hemangiomas, defined by a diameter of >4 cm, are rare but can lead to severe complications, including consumptive thrombocytopenic coagulopathy (Kasabach–Merritt syndrome) [3], intra-abdominal hemorrhage due to tumor rupture, and high-output congestive heart failure due to arteriovenous shunting [4]. It is uncommon to diagnose fetal hepatic hemangiomas during the antenatal period, but we encountered two such patients, with complications manifesting during the antenatal or early neonatal period.

Case Reports

Case 1

A 33-year-old primiparous woman was referred to us at 37 weeks and 6 days of gestation for evaluation of a fetal abdominal mass. Our ultrasound examination revealed a single fetus of a size consistent with her estimated date of confinement. A fetal intra-abdominal mass, measuring 63 mm × 50 mm × 74 mm, was observed below the right lobe of the liver. The mass contained cystic and solid areas, and a distinct border between the mass and the liver was not obvious. There was no evidence of hydrops. Fetal magnetic resonance imaging (MRI) demonstrated a mass, with low T1 and inhomogeneous high T2 signal intensity, originating from the right lobe of the liver (Fig. 1). The presumptive antenatal diagnosis was hepatic hemangioma. Six hours after the first ultrasound, the size of the fetal abdominal mass was re-evaluated and found to be 90 mm × 72 mm × 76 mm. Doppler imaging showed hypervascularity (Fig. 2). Increased systolic peak velocity in the middle cerebral artery (94 cm/s; 1.67 MoM) was also noted. The possibility of progressive fetal anemia due to intratumoral hemorrhage could not be excluded, and we decided to perform emergent cesarean delivery.

A female infant weighing 2536 g was delivered, with an Apgar score of 5 at 1 minute and an Apgar score of 7 at 5 minutes. Retractions and grunting respirations were noted in the newborn, but she did not need mechanical ventilatory support. After stabilization, the infant was transferred to the neonatal intensive care unit for further treatment. Her initial laboratory data showed thrombocytopenia (platelet count, 8.7 × 10^4/μL), and coagulopathy (prothrombin time percentage (PT%), 66%; international normalized ratio (INR), 1.34; activated partial thromboplastin time (aPTT), 58.1 s; fibrinogen, 143 mg/dL; fibrin degradation products, 76.2 μg/min; D-dimer, 36.5 μg/mL). The patient was mildly anemic, with a hemoglobin level of 12.7 g/dL. As this value did not worsen, the prenatal suspicion of intratumoral hemorrhage was not borne out. Computed tomography examination on the 2nd day of life demonstrated an 8-cm mass emanating from the right lobe of the liver. After administration of intravenous contrast, the lesion demonstrated peripheral enhancement with centripetal filling. The hepatic artery was markedly dilated (Fig. 3). Based on these findings, we confirmed the diagnosis of hepatic hemangioma. The infant gradually developed thrombocytopenia and coagulopathy. A blood sample taken on the 2nd day of life showed the following results: platelet count, 4.7 × 10^4/μL; PT%, 66%; INR, 1.32; aPTT, 90.4 seconds; fibrinogen, 92 mg/dL; fibrin degradation products, 92.1 μg/min; D-dimer, 46.2 μg/mL. These findings were compatible with disseminated intravascular coagulation, and we diagnosed Kasabach–Merritt syndrome. The infant’s thrombocytopenia and coagulopathy were intensively treated with the administration of fresh frozen plasma, antithrombin, gabexate mesilate, and propranolol. The platelet count gradually stabilized and the coagulopathy resolved, and the baby was discharged home on Postpartum Day 67 with a platelet count of 22.1 × 10^4/μL. Over 5 months of follow-up and propranolol treatment, the neoplasm has grown smaller.

Case 2

A 44-year-old primiparous Japanese woman was referred to us at 40 weeks and 1 day of gestation because a fetal intra-abdominal mass had been identified on routine ultrasonographic examination. Our ultrasound examination revealed...
a mixed solid and cystic mass, measuring 99 mm × 54 mm, with small punctate calcifications in the left upper abdomen, anterior to the stomach, of the fetus. The mass was thought to arise from the left lobe of the liver (Fig. 4A). Color and pulsed Doppler imaging showed extensive vascularization within the neoplasm (Fig. 4B). The hepatic artery supplied the mass. The descending aorta showed an increased peak velocity (181.21 cm/s), and the fetus had cardiomegaly, with a cardiothoracic area ratio of 43%, suggesting that fetal cardiac insufficiency was caused by the hyperdynamic state. The inferior vena cava was dilated, but neither polyhydramnios nor fetal hydrops was noted. Detailed fetal echocardiography revealed normal heart anatomy with tricuspid valvular regurgitation. The abdominal circumference was greater than the 90th percentile for gestational age, but the biparietal diameter was consistent with the estimated date of confinement. The umbilical and fetal arterial and venous Doppler indices were normal. At 40 weeks and 2 days of gestation, we performed cord-blood sampling. The fetal blood had a normal platelet count and coagulation parameters, and there were no signs of hemolysis (platelet count, 19.1 × 10^4/μL; PT%, 41%; INR, 1.78; aPTT, 41.8 seconds). There was no evidence of severe fetal anemia as the cause of the heart failure (hemoglobin, 11.1 g/dL; hematocrit, 35.9%). The cardiomegaly was thought to be caused by the hyperdynamic state of the fetus. At 40 weeks and 3 days, the patient went into spontaneous labor. Unfortunately, the cardiotocogram showed frequent variable decelerations, and the decision was made to perform emergent cesarean delivery.

A 3180 g male infant was delivered, with an Apgar score of 5 at 1 minute and an Apgar score of 7 at 5 minutes. The infant had marked abdominal distention, but his respiratory condition was good and ventilatory support was unnecessary. After stabilization, the infant was transferred to the...
neonatal intensive care unit for further treatment. Chest radiography demonstrated cardiomegaly without abnormalities in the lung fields (Fig. 5). Computed tomography showed an 8-cm mass emanating from the left lobe of the liver. The lesion revealed peripheral enhancement with centripetal filling after intravenous contrast administration. MRI showed T1-weighted hypointense tumors, with relatively marked hyperintensity on T2-weighted images, along with contrast enhancement after gadolinium administration (Fig. 6). Based on these findings, the clinical diagnosis of hepatic hemangioma was made. The infant’s mild cardiac insufficiency was treated with furosemide and dopamine, and his cardiomegaly gradually improved. The postnatal course remained uncomplicated, and the hematological parameters remained normal. The neonate was discharged home on Postpartum Day 18. Follow-up sonography after 3 months showed no remarkable change in the size and echogenicity of the liver lesion, despite propranolol treatment.

Discussion

Hemangiomas are benign neoplasms and the most common hepatic tumors in neonates and children [2]. In children, they can be classified as either infantile or congenital hemangiomas. Because biopsy may result in massive hemorrhage, the diagnosis is usually based on characteristic radiological findings. The differential diagnosis of a hepatic mass includes hemangioma, mesenchymal hamartoma, hepatoblastoma, metastatic neuroblastoma, and embryonal sarcoma. On MRI, hemangiomas appear as hypointense tumors on T1-weighted imaging and as relatively marked hyperintense masses on T2-weighted imaging. They also display a characteristic contrast enhancement after gadolinium administration [5]. Antenatal detection of this lesion is uncommon.

Although hepatic hemangiomas are usually asymptomatic and display spontaneous regression, larger tumors can lead to serious complications such as high-output cardiac insufficiency and consumptive coagulopathy. Hepatic artery embolization reduces blood flow through the hepatic artery. Therefore, it has been an effective treatment for high-output cardiac insufficiency and consumptive coagulopathy [1]. Postnatal surgery can increase the risk of complications and is not advised for the treatment of neonatal hepatic hemangiomas, but corticosteroid treatment and proactive therapy for congestive heart failure are helpful [6]. Recently, studies have suggested that propranolol is effective for the treatment of hemangiomas. The mechanism of action of propranolol in the treatment of hemangiomas has explained its potential for vasoconstriction in hemangiomas, decreasing expression of vascular endothelial growth factor and basic fibroblast growth factor genes through down-regulation of the RAF-mitogen-activated protein kinase pathways, and triggering of apoptosis of capillary endothelial cells [7,8]. The eponymous Kasabach–Merritt syndrome was first described in 1940, when the clinicians evaluated a newborn male with a rapidly enlarging capillary hemangioma, increasingly extensive purpura of the skin, and thrombocytopenia [9]. Kasabach–Merritt syndrome is a life-threatening disorder in which a hemangioma traps and
destroys platelets, leading to thrombocytopenia. Neonatally, the diagnosis is established based on the classic triad of a vascular tumor, thrombocytopenia, and a hemorrhagic diathesis. Conventional therapy includes administration of corticosteroids, platelets, and clotting factors. This syndrome can occur during antenatal life, and clinicians should keep it in mind if an extensively vascularized tumor is observed in a fetus. However, the grayscale and Doppler sonographic appearances of a fetal lesion do not predict the presence or severity of hematological abnormalities. Cord-blood sampling can provide useful information for parental counseling and for planning appropriate perinatal care [10–14]. Unfortunately, even with treatment, this condition may still be fatal. Morimura et al [15] reported an infant with a hepatic hemangioma and Kasabach–Merritt syndrome that died 2 days after birth. Diagnosing a hepatic hemangioma during the antenatal period gives clinicians time to familiarize themselves with Kasabach–Merritt syndrome, or to find a skilled consultant, and is therefore important in determining proper perinatal management and in guiding parental counseling.

High-output cardiac insufficiency is another possible complication of giant hepatic hemangiomas, with the predominant underlying mechanism being massive arteriovenous shunting inside the neoplasm. Antenatal signs can be attributed to increased blood flow with consequent fetal cardiac insufficiency, but, like the neoplasm itself, this complication is rarely seen in the antenatal period [16]. End-stage fetal heart failure results in hydrops fetalis. On antenatal ultrasonographic examination, high-output cardiac insufficiency is suggested by cardiomegaly (cardiothoracic area ratio > 0.35) and fluid accumulation [17]. Elevated systolic peak velocity in the descending aorta can also be seen by Doppler examination. These conditions exhibit gradual change; therefore, serial sonographic follow-up is needed.

The diagnosis of fetal hepatic hemangioma in the antenatal period is extremely rare. In 2003, Pott Bärttsch et al [18] performed an extensive literature review and extracted 16 reports of fetal giant hemangiomas. The sonographic appearance of a hepatic hemangioma is a well-defined, well-circumscribed, mixed solid and cystic lesion of varying diameter. Punctate calcifications are seen in 50% of lesions [1,5]. Hemangiomas may include echogenic septae and cystic areas very similar to mesenchymal hamartomas, but hamartomas are predominantly avascular when investigated using Doppler. Hemangiomas will demonstrate a high vascular flow. Each of the fetuses described in the present series had a solid abdominal mass with several cystic areas and small punctate calcifications; Doppler examination confirmed the vascular nature of the lesions. Other typical color Doppler findings are enlarged feeding and draining vessels. Associated findings suggestive of the diagnosis are a dilated hepatic artery and hepatic veins, cardiomegaly, or evidence of cardiac failure. These findings correspond positively with the vascularity of the neoplasm. Many investigators have reported a high incidence of right-lobe involvement across all liver neoplasms [9]; however, no explanation for this finding has been reported. In our second patient, the lesion originated from the left lobe. This unusual location initially confounded our prenatal diagnosis; however, the vascular connections seen on Doppler imaging revealed the correct diagnosis.

We encountered two patients with a giant hepatic hemangioma, diagnosed during the antenatal period. As in the postnatal period, the clinical presentation of a hepatic hemangioma during fetal life is highly variable. Giant hepatic hemangiomas can lead to life-threatening complications such as cardiac insufficiency and Kasabach–Merritt syndrome, and these complications may occur during the fetal or early neonatal period. Accurate prenatal diagnosis and serial sonographic follow-up allow for proper timing of delivery and prompt postnatal therapy.

Fig. 6  Transverse magnetic resonance imaging showing T1-weighted hypointense masses with relatively marked hyperintensity on T2-weighted images and contrast enhancement after gadolinium administration.

References


