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Case Report

Discrimination of fetal intracranial mass- haemorrhage via superb microvascular imaging in a case and review of literature

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ABSTRACT

Objective: In this case report we aimed to present use of superb microvascular imaging (SMI) in the discrimination of fetal intracranial mass and haemorrhage with the lights of literature.

Case Report: 21 weeks pregnant woman applied to the clinic for routine obstetrics control. Ultrasonography (US) was applied to the patient. In the gray scale US, intracranial midline a large mass was detected. In the colour Doppler (CD), the blood flow (BF) to the mass was not clearly seem. Power Doppler (PD) appeared to be very artefacts. In colorSMI (cSMI) and monochrome SMI (mSMI), blood flow (BF) of the mass was seen clearly and fetal intracranial mass was prediagnosed. Magnetic Resonance imaging (MRI) was performed to determine the location of the mass, brain parenchyma and origin of the mass. Intracranial midline a large mass was detected in fetal MRI too.

Conclusion: Although there are cases in the literature regarding the use of US in fetal central nervous system malformations (CNS), discrimination with SMI in fetal brain was not discussed. In our case; we have detected fetal intracranial mass by gray scale US, and we have evaluated vascularization of the mass by CD, PD, cSMI and mSMI. SMI modes were showing superiority when compared to CD and PD. Vascularization could be seen more clearly by mSMI when compared to cSMI.

Keywords: obstetrics ultrasound; superb microvascular imaging; fetal intracranial tumor

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Introduction

With the development of ultrasound (US) devices, more fetal anomalies can be detected during antenatal period. However, the prenatal diagnosis experience of fetal intracranial tumors is limited due low incidence. The incidence of brain tumors represent 0.5-1,5% of all pediatric CNS tumors (1). An intracranial tumor should be suspected when a mass-occupying lesion with cystic or solid areas is seen in the fetal head, or when there is a change in the shape or size of normal anatomical structures (2). US is the first modality of choice to determine pregnancy and fetus. It is non invasive, safe due absence of radiation, low in cost and has wide spread availability (3). When a mass in the fetus is encountered; screening for vascularization with US is the first study to be done in terms of differentiation of hematoma and malignancy. Sonographic findings of fetal intracranial hematoma (ICH) can be variable. In general, this situation is thought to be due difficulty of distinguishing from other intracranial lesions. However, with the continuous development of US equipment, the number of fetal intracranial lesion diagnoses is increasing (4). Superb Microvascular imaging (SMI) is a new vascular imaging technique which allows us to demonstrate very slow blood flows (BF) and microvascular structures eliminating motion artifacts. SMI can be operated in 2 modes: color SMI (cSMI) and monochrome SMI (mSMI). The cSMI mode simultaneously displays a conventional gray-scale US with color encoded Doppler signals.

The mSMI mode improves the visibility of vascular structures by eliminating the background signals and focusing only on the vasculature signals (5,6). In this case, we aimed to present the sonographic findings of a fetal intracranial mass detected by US, confirmed by SMI and distinguished from bleeding. Intracranial mass was also confirmed by fetal magnetic resonance imaging (MRI).

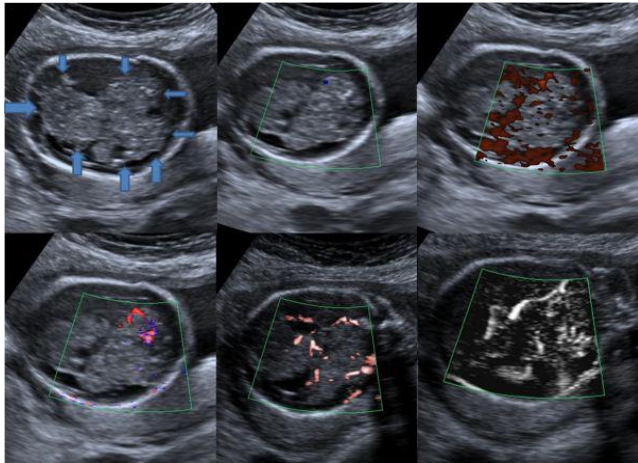
Case Report

A 26-year-old 21-week pregnant woman applied to the clinic for routine obstetric control. The patient had a 3-year-old child who was born with normal vaginal delivery. US was performed to the patient for obstetrics screening of fetal anomaly with Aplio 300 US system (ToshibaMedicalSystems, Tokyo, Japan). In the gray scale US, intracranial midline a large mass was detected. In the colour doppler (CD), the BF to the mass was not clearly seem. Power Doppler (PD) appeared to be very artefacts. In cSMI and mSMI, BF of the mass was detected clearly and fetal intracranial mass was prediagnosed (Figure 1). MRI was performed to determine the location of the mass, brain parenchyma and origin of the mass. Intracranial midline a large mass was detected in fetal MRI too (Figure 2). There was no history of chronic disease or drug use in the patient. Her first child was completely healthy. Parents wanted to terminate pregnancy with their own decisions and their own written consent. The histological examination showed teratoma in autopsy material.

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Figure 1. Ultrasonographic images of fetal cranial mass

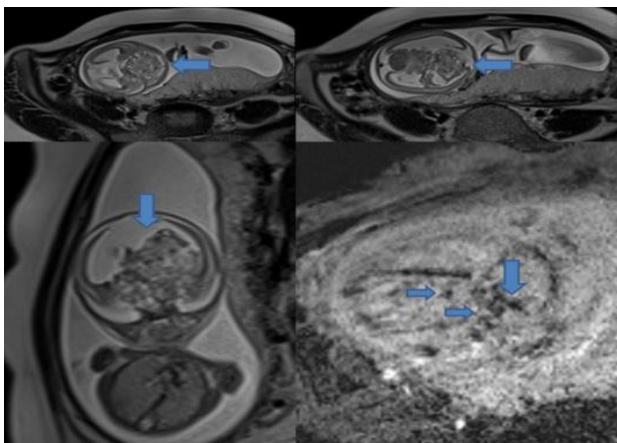


In the gray scale US, intracranial midline a large mass. In the CD, the blood flow to the mass is not seem clearly. PD was very artifact. In cSMI and mSMI, BF of the mass was seem clearly. (US: ultrasound, CD: color Doppler, PD: power Doppler, cSMI: color superb microvascular imaging, mSMI: monochrome superb microvascular imaging, BF: blood flow)

Discussion

Fetal intracranial tumors are rare. Unlike the more common pediatric brain tumors, they are mostly supratentorial. Teratomas are the most common, followed by neuroepithelial tumors and lipomas. Masses can have cystic-solid components, and internal calcification and bleeding are common in masses (7). Distinguishing from fetal ICH is very important for clinical prognosis. Prenatal diagnosis of fetal ICH is difficult as it is difficult to detect and distinguish from other intracranial lesions. However, with the continuous improvement in US, there is an increase in the number of diagnosed cases (8). US is the basis for fetal imaging. Advances in resolution with modern equipment and new vascular imaging techniques have become very important in fetal screening. CD and PD are now widely available. Although MRI is not as accessible as US, it is an excellent tool for problem solving, especially in the brain (8,9). In US, fetal hydrocephalus, polyhydramnios, hydrops fetalis and even fetal death can be associated with intracranial mass. They have high growth potential with tumor sizes larger than 5 cm at presentation. The exact diagnosis is determined only in the histological study of the tumor fragment (9).

Figure 2. MRI images of fetal cranial mass



In axial and coronal T2 weighted images intracranial heterogenous mass lesion is seem. In SWI image; blood components with hypointense areas as shown by arrows and calcifications are seen. (SWI: susceptibility weighted image)

Fetal ICH also have sonographic features including loss of normal cerebral parenchyma and marks, variable echogenicity, avascular intracranial mass, hyperechoic acute clot adherent to choroid plexus, hyperechoic clot outlining cerebral cortex, hyperechoic nodular ependyma, increased periventricular white matter echogenicity, porencephaly and hydranencephaly (8).

At CD and PD, ICH shows no vascularization (10). But although conventional Doppler imaging techniques (CDIT) provides valuable data for evaluating BF, it does not disclose fine vessels and low velocity BF data. There fore, due motion artifacts, CDIT is associated with data loss. There are studies in literature reporting that CDIT has important limitations regarding the evaluation of vascularization, especially in children, in neonatal and prenatal period (11-14). SMI is a new imaging method of vascularization which allows us to visualize very slow BF and microvascular structures eliminating motion artefacts (5,6). There are studies in the literature reporting the superiority of SMI when compared to other CDITs (11,13,14,15,16,17). In our case report; we have detected the vascularity of fetal intracranial mass clearly with SMI when compared to the CDITs. However, when we look at the literature, there are limited publications or case reports focusing on US regarding intracranial masses in fetal intracranial tumors (9,18,19). In 1998, Chung et al. (18) reported a congenital gangliocytoma with US features containing both cystic and solid components, located suprasellar and causing significant displacement of the circle of Willis. Milani H.J, et al (19) reported 15 weeks of gestation with immature teratoma, 29 weeks of gestation with teratoma, 28 weeks of gestation with craniopharyngioma cases with fetal MRI and fetal sonographic features. But they have not mentioned about vascularization properties of the masses. Goeral K, et al (13) reported superiority of SMI with regard to anatomical detail and density of visible microvessels in their study which they have evaluated brain parenchyma by transcranial US with SMI in 19 healthy term born neonate. They have suggested that mSMI was slightly superior to cSMI. Hasegava J. (14) et al. have evaluated fetal and placental circulation by SMI. They have reported that SMI has high potential for the evaluation of placental function including accurate grading which allows early detection of placental insufficiency and provide a full profile for fetoplacental function.

Although there are cases in the literature regarding the use of SMI in obstetrics, there are limited case reports in which fetal intracranial mass was evaluated by SMI to our knowledge. In our case; we have detected fetal intracranial mass by gray scale US, and we have evaluated vascularization of the mass by CD, PD, cSMI and mSMI. SMI modes were showing superiority when compared to CD and PD. Vascularization could be seen more clearly by mSMI when compared to cSMI. We also wanted to present MRI features of mass but we specifically wanted to highlight the SMI findings of the mass.

In conclusion; evaluating vascularization is vital in making a decision about the nature of the mass and in terms of the progress of treatment and future prognosis. In differentiating fetal intracranial hemorrhage and mass, SMI can be used effectively because it can show whether there is vascularity with high sensitivity.

Disclosure

Authors have no potential conflicts of interest to disclose.

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