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Ultrasonography and Magnetic Resonance Imaging in a Fetus with Sacrococcygeal Teratoma: A Case Report

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ABSTRACT

Background & Objective: Sacrococcygeal teratomas (SCTs) are uncommon germ cell tumors with significant perinatal and postnatal mortality and morbidity rate.

Case Report: We present a case of large fast growing (86x63mm) mostly cystic SCT in a 27-year-old woman with 23 weeks of gestational age and normal first trimester ultrasound exam. The fetus was evaluated by both magnetic resonance imaging (MRI) and ultrasonography.

Conclusion: Findings regarding tumor location, size, and content were similar for both sonography and MRI methods, though vascular pattern was detected with higher accuracy and more details by sonography. Meanwhile, MRI provided more appropriate information about tumor effects on surrounding tissue and conus location.

Keywords: Fetus, Magnetic resonance imaging, Sacrococcygeal teratoma, Ultrasonography

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Introduction

Although sacrococcygeal teratoma (SCT) is a rare tumor among total population, it is one of the most common neoplasia in neonates. Unlike in adults, the most common sites for fetal teratomas is sacrococcygeal level **(1)**. Due to the enormous size and large blood supply, there is increased risk of high output cardiac failure and subsequent hydrops fetalis **(2)**.

Some studies show the role of fetal magnetic resonance imaging (MRI) to make a precise diagnosis, and especially for making in-utero treatment planning **(3)**. Also, Power Doppler can be utilized for mapping of the entire vascular structure of the tumor.

As treatment options, disruption of the vigorous vascular shunting of fetal SCT has been performed by in-utero tumor resection, thermos-coagulation, or radio frequency ablation **(4)**. For this purpose, color Doppler ultrasound is crucial adjunct to MRI for accurate evaluation of the structural defects of the fetus and vasculature of the tumor in the prenatal evaluation of fetal SCT.

This study presents a case of SCT diagnosed in a 19-week fetus and compares its ultrasound and MRI findings.

Case Report

A 27-year-old woman (G1P1; 23 weeks of gestational age) was referred to our department (tertiary center) for second opinion ultrasound as a case of STC in a female fetus. Her regular antenatal check-ups were normal. The first trimester scan showed normal findings with no anomalies (Figure 1a), but scan at 19 weeks showed a 47*36 mm mostly cystic tumoral mass in sacrococcygeal region without any other anomalies or evidence of hydrops fetalis as ascites, pleural, or peri-cardial effusion (Figure 1b). There was no history of

congenital anomaly or congenital tumors in the parents or their relatives and the patient received no medication.

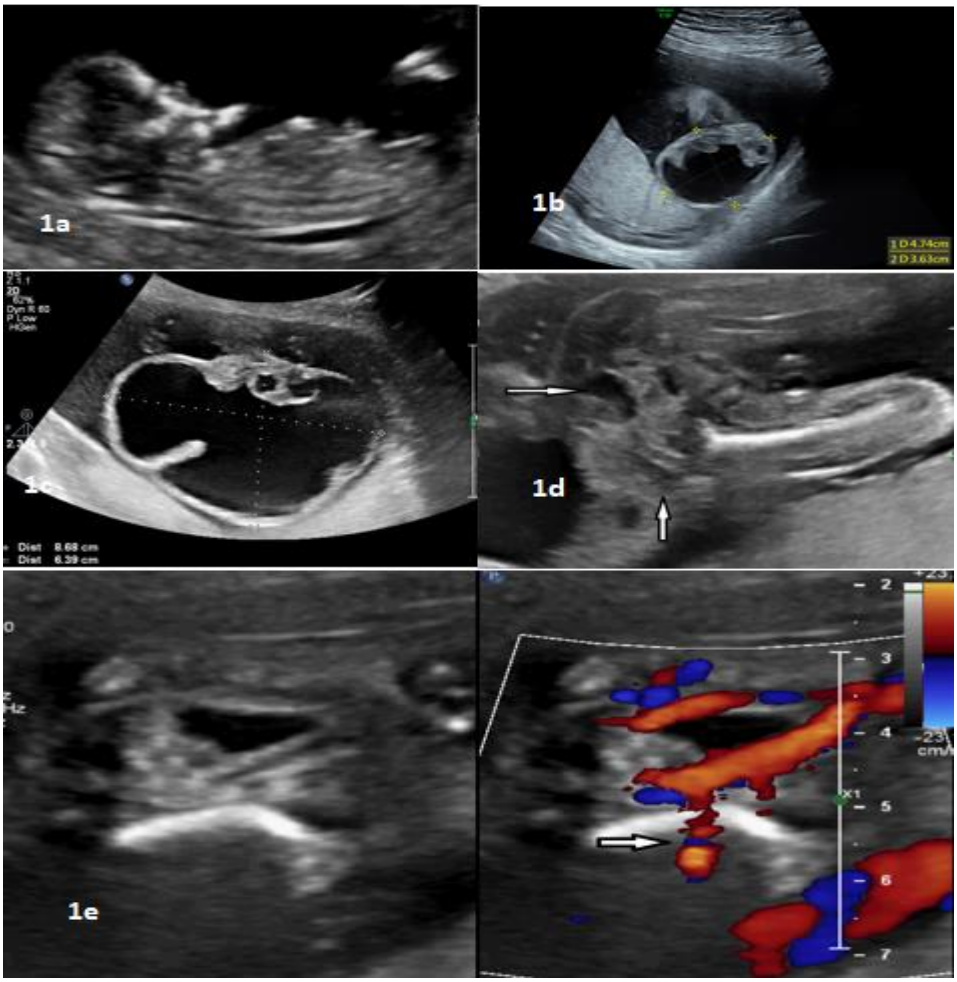


Figure 1. Fetus with SCT (19 weeks of gestational age). 1a, Normal first trimester sonography. 1b, Tumor size of 47* 36 mm with predominantly cystic component in axial view. 1c to 1e, Follow-up sonography of the fetus at the 23th gestational week. 1c, Axial view shows rapid increase in tumoral dimensions. 1d, Coronal view shows normal ossification of sacral bony structures. 1e, Anterior displacement of bladder (transverse arrow), but it's boundary with adjacent buttock tissue was unclear (vertical arrow). Color Doppler reveals vascular supply of tumor from iliac artery branch near its bifurcation.

Ultrasound scan showed a mostly cystic exophytic lower pelvic mass with small solid component measuring 86x63mm (Figure 1c). The mass size increased vividly during these 4 weeks. It appeared to originate from the tip of an otherwise normal sacrum (Figure 1d). Fetal posterior fossa was normal, without signs of Chiari II malformation. The mass extended into the fetal pelvis and displaced bladder anteriorly measured around 25x15mm suggestive for type 2 SCT. Because of its mostly cystic components, the margin of this part was clearly visible by sonography but its boundary with adjacent buttock tissue was unclear (Figure 1d). In color Doppler evaluation, the mass received blood flow from branches of iliac artery near its bifurcation (Figure 1e). No signs of cardiac dysfunction, such as cardiomegaly or tricuspid regurgitation were found. No other abnormalities or signs of hydrops were detected.

The parents wanted to know about the possibility of in-utero treatment such as radio frequency ablation of the mass vascular supply and the precise extension. Two days later, MRI was performed by a 1.5 T Signa system (General Electric Medical Systems, USA) equipped with a phased-array 16 channels surface coil. MRI confirmed the ultrasound findings about the mass size, location and intra pelvic extension, contents and its effect on adjacent structure in pelvis (Figure 2a). However, its boundary with adjacent buttock muscles was more obvious by MRI compared to ultrasound (clearer in FIESTA compared to SS-FSE sequences). The left buttock muscles were compressed by the solid part of the mass (Figures 2b,2c). Also, conus location was clearer in MRI (Figure 2d). On the other hand, bony structures as sacrum and vascular supply of the mass could not be evaluated well as color Doppler

study in both MRI FIESTA and SS-FSE sequences (Figures 2b,2c).

After complete consultation with parents about exact extension of the mass in all imaging modalities and in-utero treatment options, they chose termination of pregnancy, especially based on the mass rapid growth. Karyotype evaluation and gene study were done on fetus based on parent's request, which revealed normal male chromosomal complement from cytogenetic point of view. Postnatal evaluation confirmed the diagnosis of SCT (Figure 2e).

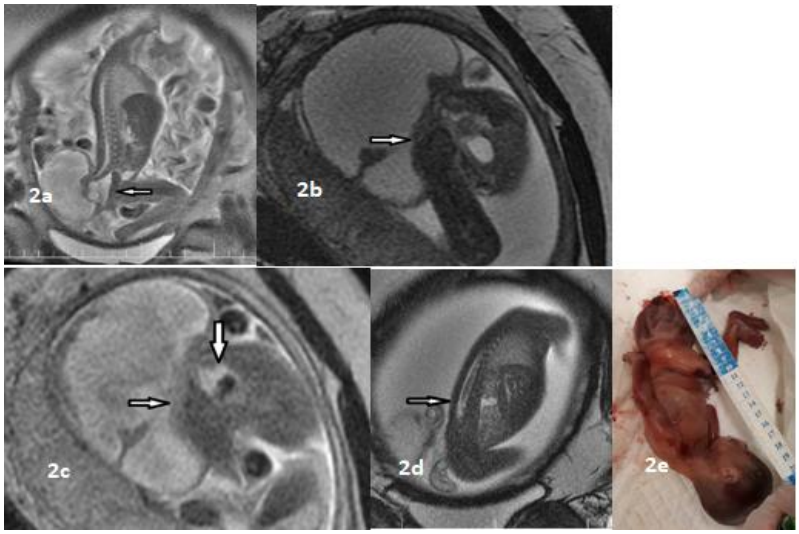


Figure 2. MRI evaluation of SCT in the fetus. 2a, Sagittal SS-FSE image confirms ultrasound findings about the mass size, location, and intra pelvic extension and its effect on adjacent structure in pelvis. 2b and c, Axial FIESTA and SS-FSE sequences demonstrate left buttock muscles were compressed by the solid part of the mass, clearer in b compared to c (transverse arrow). Also, vertical arrow in c shows intra pelvic extension of SCT. As mentioned, vascular supply cannot be evaluated in details. 2d, Sagittal FIESTA sequence reveals normal conus location. 2e, The post-mortem photography of male fetus with the mass arising from the caudal part.

Discussion

The incidence rate of SCT is 1:40000 with a 3:1 female predominance. Teratomas occur most often in a para-axial area, gonadal, or midline location from the brain to sacral area. Most SCTs are solid or solid-cystic, with 15% being purely cystic. Despite the benign nature of majority of the cases, SCTs are associated with high morbidity and mortality due to preterm deliveries, complications like hemorrhage, obstruction of umbilical blood flow, high output cardiac failure and malignant invasion. Death happens primarily in fetuses with solid and highly vascularized fast growing teratomas that can lead to high output cardiac insufficiency. This happens because the tumor acts as a large arteriovenous malformation **(2,4)**.

Because some of these complications can be prenatally detected and treated appropriately, the prenatal diagnosis of SCT is very important. Also, there are various management options including termination of pregnancy, radio frequency ablation, laser vessel ablation, intrauterine surgery and early neonatal surgery **(5,6)**. Most recent evaluations show the Providence of MRI to ultrasound in the evaluation of SCT. However, some other studies support the significant role of MRI in the therapeutic planning **(3,7,8)**. Also, the color Doppler is a useful technique due to high vascularity of some types of these tumors, especially solid ones **(9)**. As far the researchers investigated, no evidence has discussed the sensitivity of color Doppler sonography to detect tumoral vascular pattern.

In the present study, MRI was considered as a method complementary to ultrasound, providing appropriate information about tumor effects on surrounding tissue and conus location. The boundary of cystic part in pelvis was vivid in ultrasound exam but its solid part margin was not clear with adjacent buttock muscles in sonography compared to MRI. However, color Doppler sonography was more accurate in the evaluation of the vascularity, allowing the information about feeding arteries.

In a case described by Sugitani *et al.* **(10)**, Doppler ultrasonography with power Doppler were utilized to show intra-tumoral vessels for differentiating SCT from sacral meningomyelocele. In our case, we used color Doppler not only for confirming the diagnosis but also for describing vessels distribution as feeding arteries and draining veins. Furthermore, Bettina W. *et al.* showed the effect of radiofrequency ablation to interrupt blood flow to a SCT through using color Doppler data **(11)**.

Conclusion

Although MRI is a proven imaging modality for diagnosis and pretreatment planning of fetal SCTs, properly performed and interpreted color Doppler sonography not only contributes to diagnosis but also serves as an important guide to vascular mapping for in-utero treatment planning and counseling. Most studies focus on MRI findings and they neglect the benefits of color Doppler in vascular mapping. Larger population-based studies are required to elucidate this hypothesis.

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Conflict of Interest

Authors declared no conflict of interests.

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