Original Article

Antenatal Diagnosis Of Sacrococcygeal Teratoma, The Combined Use Of Fetal MRI And Ultrasound In Diagnosis. Case Series

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Abstract

Background & Objective Sacrococcygeal teratoma is the most common Congenital neonatal tumour. Sacrococcygeal teratoma (SCT) can be detected by ultrasound in early foetal life. Currently, prenatal ultrasonography enables examination of tumours, but it does not always provide all the needed data. The purpose of this study was to highlight the most important features of SCTs detected by foetal MRI adding to ultrasound information. **Case series** Between 2015 and 2020, Four cases of sacrococcygeal teratomas were either diagnosed in our hospital or referred to our hospital for foetal magnetic resonance imaging. Antenatal ultrasound screening was done at our hospital preceding foetal MRI examination. As surgery is the mainstay for management of SCT, the required data before surgery include tumour dimensions, content, mass effect, and type of sacrococcygeal teratoma according to The American Academy of Paediatrics' surgical section (APPSS). Foetal magnetic resonance imaging (MRI) was ideal for tumour classification using the aforementioned criteria. MRI better characterizes tumour content, its extent and relation to surrounding structures compared to ultrasound and enables a precise structural assessment of the central nervous system. **Conclusions** Foetal MRI is very informative in the prenatal diagnosis of SCTs as it overcomes the limitations of obstetric ultrasound providing additional data.

Keywords: Magnetic resonance imaging, antenatal ultrasound, sacrococcygeal masses, teratoma.

INTRODUCTION

Sacrococcygeal teratoma is the most common congenital neonatal tumour, occurring in approximately 1/35 000 to 1/40 000 live births. (1) Foetal teratomas are believed to arise from an aggregation of totipotent cells in the primitive streak, also called the Hensen's node. Remnants of this area may persist and give rise to SCTs that contain cells from all 3 germ layers. Sacrococcygeal teratoma is classified according to The American Academy of Paediatrics' surgical (APPSS) based on its location and extent into 4 types ***(Table 1)***. *(2&3)* ***Figure 1***

Table (1) classified of sacrococcygeal teratoma according to The American Academy of Paediatrics' surgical (APPSS)

Type I	Predominantly external with minimal presacral component.
Type II	Present externally but with significant intrapelvic extension.
Type III	Apparent externally but predominantly a pelvic mass extending into the abdomen.
Type IV	Presacral with no external presentation.

Objectives

The purpose of this case series is to highlight the most important features of SCT on ultrasound and compare these with the MRI findings.

Methods

The radiology search system was queried for all cases of sacrococcygeal teratoma diagnosed antenatally between 2015 and 2020 in a single institution. Cases were classified using the APPSS classification. Ultrasound and MRI images were reviewed and compared.

Results

Four cases of sacrococcygeal teratoma were either diagnosed in our hospital or referred to our hospital for foetal magnetic resonance imaging. Antenatal ultrasound screening was done at our hospital preceding foetal MRI examination. Type I SCT was seen in one patient, type III in two patients, and type II in single patient.

Type I sacrococcygeal teratoma.

A 26-year-old primigravida was referred for MRI after a diagnosis of presacral tumour was made on a routine antenatal ultrasound. Antenatal ultrasound showed a mixed cystic and solid mass at the sacral region which appeared to be predominantly external in location. MRI was performed in the 18th week of pregnancy. T2WI sequences revealed a large mass lesion adhered to the coccyx No abdominal extension was observed (Figure 2), and the teratoma was classified as type I. The tumour was a solid structure with some cystic components. No attachment to any pelvic organs was seen, and no intraspinal extension or abnormalities in the central nervous system were noted. No abnormal signal intensities were noted in abdominal organs suggestive of metastatic deposits.

Figure (1) sacrococcygeal teratoma according to the American Academy of Paediatric surgery section (APPSS)

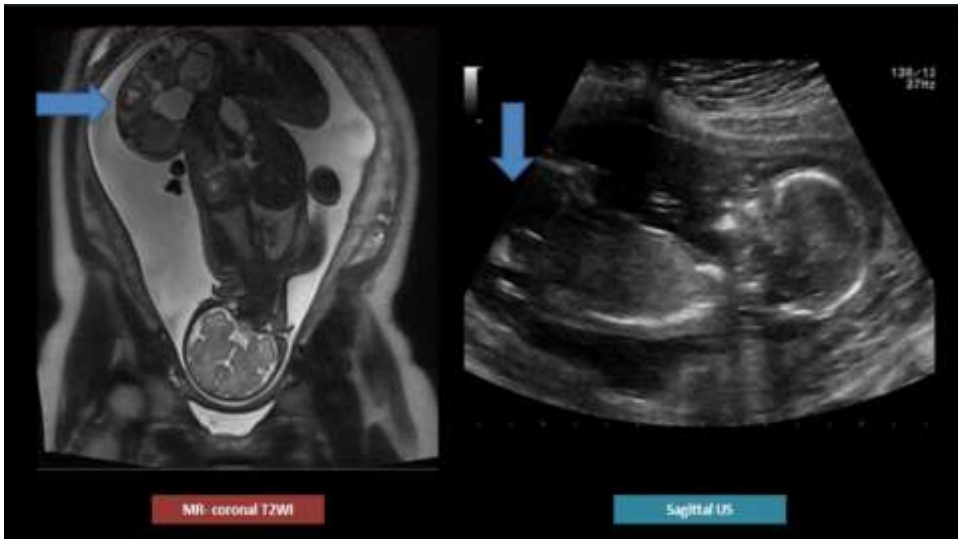
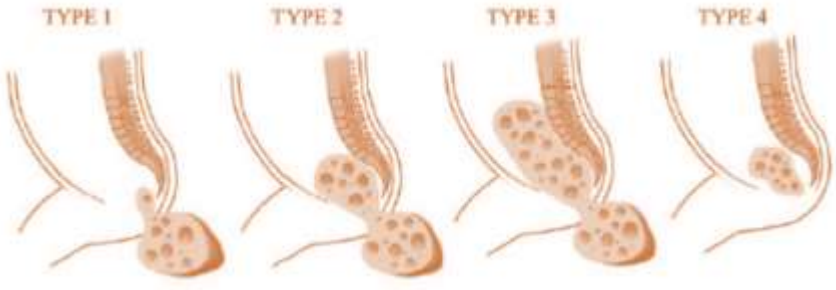


Figure (2) Coronal T2W MRI images and sagittal ultrasound showing mixed cystic and solid sacrococcygeal teratoma (Arrows) predominantly external (Type 1) and it does not appear to be attached to any of the pelvic organs



Type 2 sacrococcygeal teratoma

A 25-year-old female primigravida was referred by the obstetrician for foetal MRI after an antenatal ultrasound that showed a predominantly solid presacral mass lesion. The antenatal ultrasound (Figure 3) had been performed at 32 weeks of gestation and had shown a predominantly solid presacral mass lesion with both internal and external components, being bounded by the sacral spine posteriorly and the urinary bladder anteriorly. The urinary bladder was seen displaced anteriorly. Colour doppler interrogation showed internal vascularity in the internal component of the mass. Fetal MRI (Figure 4) demonstrated both internal and external components (significant intrapelvic extension) of the mass suggestive of type 2 sacrococcygeal teratoma, with small cystic components of the external component. the relations of the mass were better delineated by MRI, showing anterior displacement of the uterus and urinary bladder with no central nervous system abnormalities.

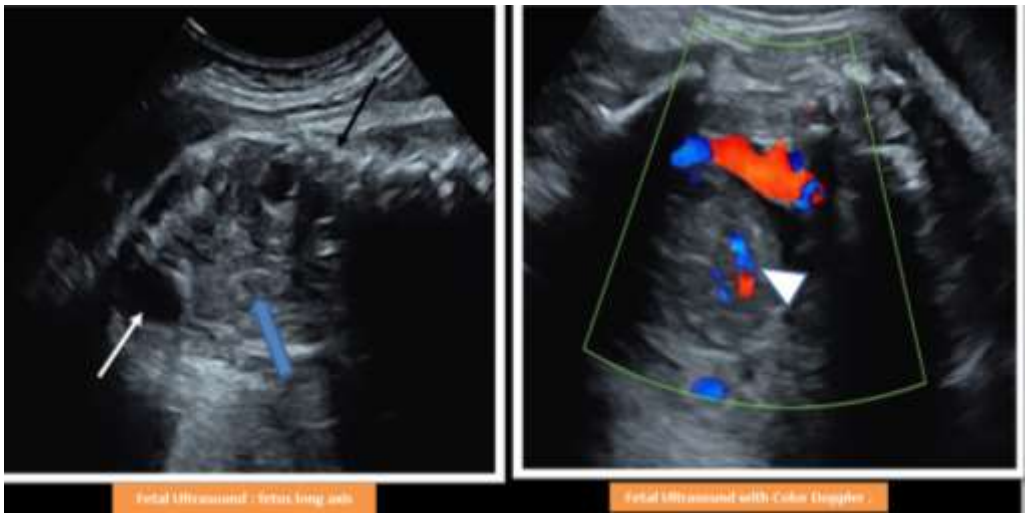


Figure (3) Ultrasound images of the same fetus showing the internal component of the teratoma (blue arrow) which shows internal vascularity at color doppler interrogation (arrowhead). The lesion appears to lie between spine posteriorly (black arrow) and urinary bladder anteriorly (white arrow).

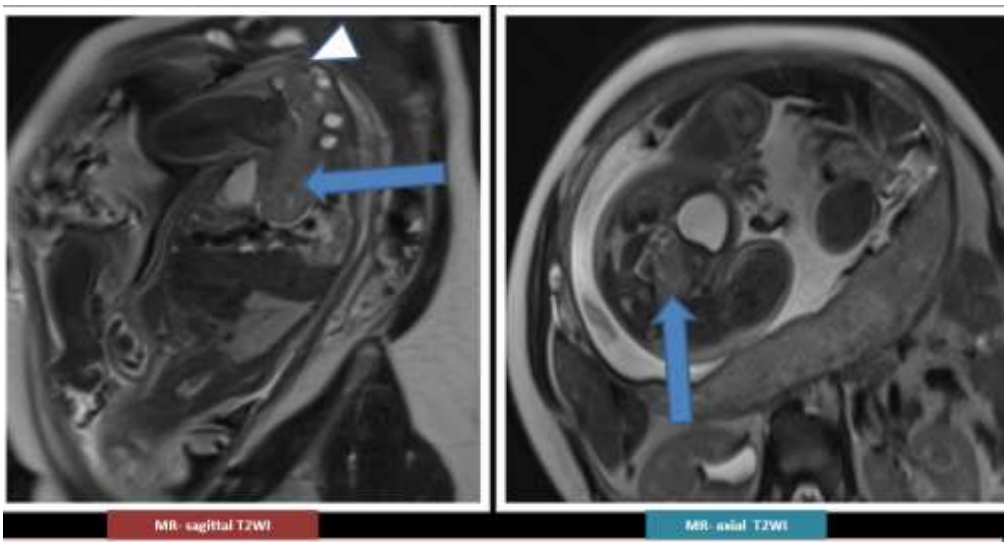


Figure (4) T2W MRI images (sagittal and axial) There is a large, predominantly solid, sacrococcygeal teratoma with both internal(arrows) and external components (arrowhead). The internal component appears to displace uterus and urinary bladder anteriorly.

Type 3 sacrococcygeal teratoma.

A 30-year-old multipara was referred for an outpatient MRI due to routine antenatal scan showing a complex presacral mass lesion. Antenatal ultrasound was done at the 27th week of gestation, followed by MRI 1 week later. Antenatal ultrasound showed a predominantly cystic mass lesion in the presacral region with an external component and an internal pelvic component with intra-abdominal extension.

Foetal MRI scan revealed a predominantly cystic, heterogenic mass located in the fetal pelvis and adherent to the coccyx. Fetal MRI demonstrated both components of the mass and delineated a solid component more prominent at the abdominal cavity, displacing bowel loops superiorly. No intraspinal extension was noted (Figure 5).

Figure (5) sagittal T2W MRI image showing a large sacrococcygeal teratoma with solid internal component and cystic external component, the internal component was seen extending into the abdominal cavity in keeping with type III sacrococcygeal teratoma. Sagittal ultrasound image showing a predominantly cystic presacral mass with both internal and external component, the solid component was not appreciated at this exam.

The second case of type III sacrococcygeal teratoma (Figure 6) was diagnosed at 31 weeks of gestation during routine antenatal scan and was referred for an antenatal MRI scan. MRI showed a large sacrococcygeal teratoma with solid and cystic components (predominantly cystic). Both the external component and the large intra-abdominal component were well-visualized, as well as the mass effect on abdominal organs with superior displacement, in keeping with type III sacrococcygeal teratoma.

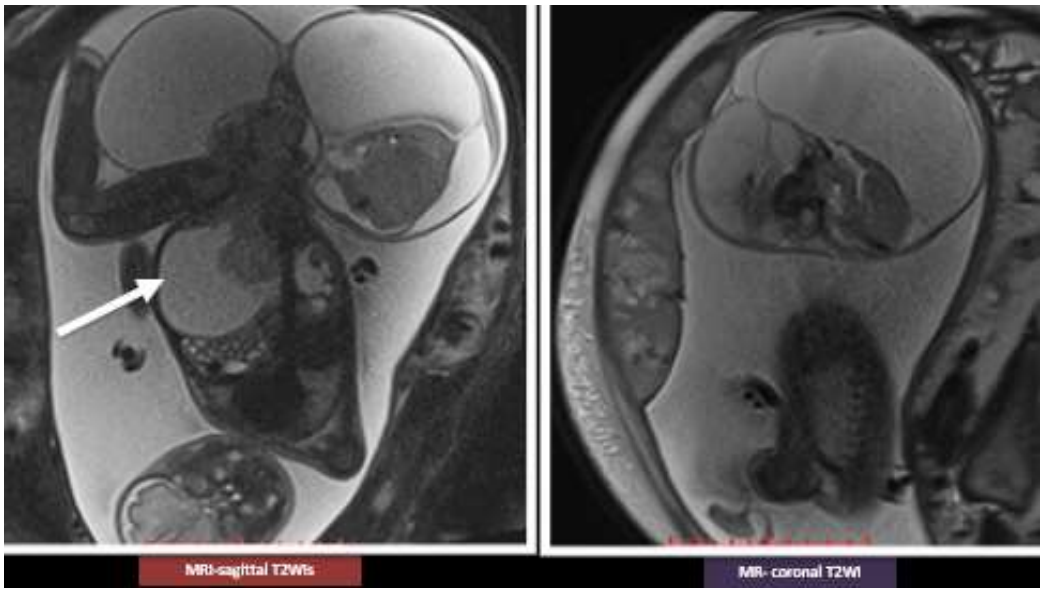


Figure (6) MRI: large sacrococcygeal teratoma with solid and cystic components (predominantly cystic). It shows both external component and large intra-abdominal component (in keeping with Type III sacrococcygeal teratoma.

Discussion

Ultrasound is useful in assessing the presence of cystic and solid components as well as the presence of calcifications which are important when assessing for tumour maturity. It is also useful for assessing tumour size and location with evidence of extra-foetal, intra-pelvic or intra-abdominal extension. Colour Doppler can be used

to assess tumour vascularity. The prognosis of prenatally detected sacrococcygeal teratoma seems to be related not only to the size of the mass but also to its content, extension, and presence of metastases. Also, the Tumour composition is important in prognosis. In s small case studies, predominantly solid tumours have been reported to have a worse prognosis than predominantly cystic tumours (4,5). There is an increased risk of fetal cardiac compromise in solid tumours as the solid tumours tend to be more vascular and shunt blood away from the placenta because they grow larger. Consequently, solid tumour volumes and derived indices are predictive of poor prognosis and high-output cardiac failure (6). Foetal MRI provides better characterisation of the presence of colonic or ureteric obstruction, hip dislocation, other pelvic or abdominal organs displacement, assessment of intra-spinal extension and the presence of metastases. Additionally, MRI can overcome acoustic shadowing by foetal pelvic bones which interferes with ultrasound visualization.

Conclusion

Ultrasound is useful for assessing SCT tumour location, dimensions, maturity, and extent. MRI is useful for picking up additional information such as intra-spinal and other organ involvement, as well as mass effect, also MRI can overcome acoustic shadowing by foetal pelvic bones which interferes with ultrasound visualization without the hazard of ionizing radiation.

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