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Mesoblastic nephroma: prenatal ultrasonographic and MRI features

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Abstract Antenatal detection of mesoblastic nephroma by US is possible. Reviewing the literature, we found 19 previously reported cases, only 1 of which underwent prenatal MRI. We present a further case diagnosed by US and confirmed with MRI. The imaging findings and differential diagnoses are discussed. Early and correct detection of this rare entity is of great interest, as it may facilitate prevention and management of severe obstetric and neonatal complications such as polyhydramnios and prematurity. MRI can help to evaluate the origin and the morphological features of a fetal abdominal mass.

Case report

Ultrasound screening of a 25-year-old healthy woman at 35 weeks' gestation detected enlargement of the right fetal kidney with suspicion of a solid mass (Fig. 1). No other abnormality was observed. Half-Fourier acquisition single-shot turbo-spin-echo (HASTE) MRI sequences of the fetal abdomen were performed in different planes without any premedication. These demonstrated a 3-cm, well-circumscribed renal tumour whose signal was homogeneous and similar to that of normal renal parenchyma (Fig. 2). The left kidney appeared normal. Mesoblastic nephroma or Wilms' tumour was suspected and the pregnancy was allowed to progress to term.

At 38 weeks' gestation, the patient developed cholestasis of unknown aetiology, but without any evidence of fetal distress. A 2730-g male infant was delivered by caesarean section, with an Apgar score of 9 at 9. Abdominal CT showed no evidence of regional spread. Radical nephrectomy was performed and the postoperative course was uncomplicated. Histological study revealed a typical mesoblastic nephroma, 3.5 cm in diameter involving 75% of the right kidney (Fig. 3). Tumour tissue was present at some excision margins, but not at the renal hilum. The child was well at follow-up 10 months later.

Discussion

Most renal masses detected in utero are cystic (hydronephrosis, multicystic dysplastic kidney). If a solid renal tumour is suspected, the role of imaging is to differentiate it from bilateral kidney enlargement (autosomal recessive polycystic kidney disease, diffuse nephroblas-

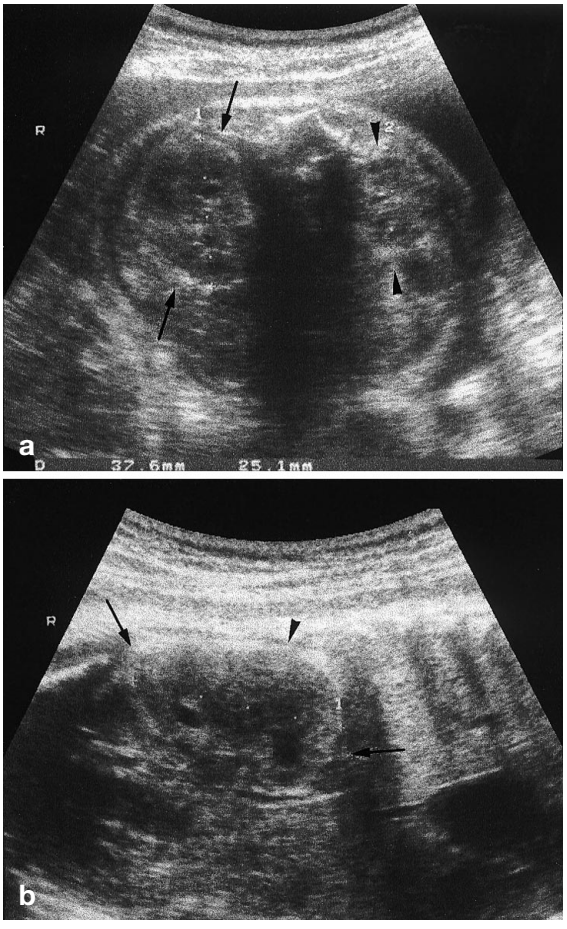

Fig. 1 a, b Prenatal US at 35 weeks' gestation. **a** Transverse scan of the fetal abdomen shows enlargement of the right kidney *(arrows)*. The left kidney appears normal *(arrowheads)*. **b** Sagittal scan of the right fetal kidney *(arrows)* shows displacement of lower and upper calyces by a solid homogeneous renal mass *(arrowhead)*

tomatosis, Beckwith-Wiedemann syndrome) and from tumours arising from other organs (liver tumour, adrenal neuroblastoma). Mesoblastic nephroma is a rare benign mesenchymal renal tumour whose prognosis is generally excellent after surgical excision. It occurs almost exclusively in the neonatal period or early infancy. It is the most common fetal renal neoplasm. To our knowledge, 19 cases of antenatal detection with sonography have been reported. Five cases of prenatal Wilms' tumour have also been described [1]. These two entities are not distinguishable on imaging. Other differential diagnoses are very rare and include rhabdoid tumour and unilateral renal vein thrombosis.

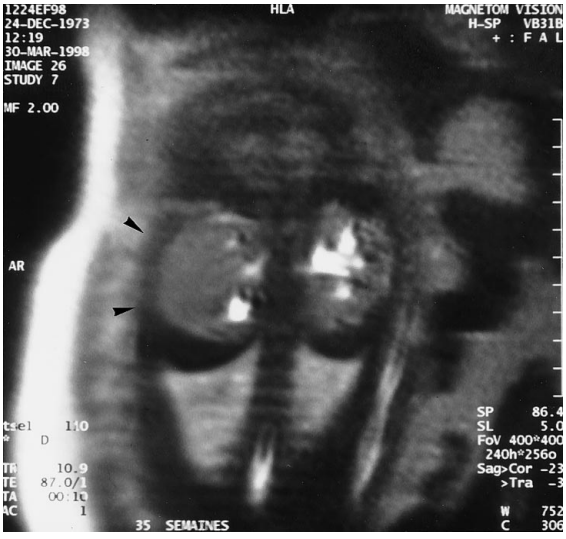

Fig. 2 Coronal HASTE T2-weighted sequence at 35 weeks' gestation confirms the well-circumscribed renal tumour *(arrowheads)* whose signal is similar to that of normal renal parenchyma. Hyperintense displaced calyces are not dilated

Prenatal imaging findings

The earliest detection of mesoblastic nephroma has been made at 26 weeks' gestation [2]. The smallest tumour is our case, which measured 3.5 cm. This may be due to improvement in US image resolution. In most cases, the origin of the tumour has been suspected correctly from the prenatal US. The mass arose either from the kidney and was indistinguishable from it, or in the renal fossa or at least in an upper quadrant of the abdomen. An abdominal tumour with an absent ipsilateral kidney has been described [3]. In the case of Boulot et al. [4], the tumour was not clearly visualised and the only anomaly was enlargement of the fetal kidney. However, no normal renal tissue was recognisable at gross examination.

Echogenicity of the mass is variable. Several authors have described it as heterogeneous, although very few have reported histological correlation with necrotic or cystic changes. Two authors described small echogenic nodules within the tumour [5, 6]. Geirsson et al. [7] reported that the outlines of the mass were difficult to define, as its echogenicity was similar to that of intestinal loops; external compression on the stomach and the bladder first alerted the operator.

We found only two previous descriptions of fetal renal neoplasm demonstrated by MRI: one case of mesoblastic nephroma [8] and one of Wilms' tumour [3]. In the former, the MRI technique is not described. In the latter, published in 1990, spin-echo and gradient-echo sequences were performed after injection of pancuronium bromide into the umbilical vein. In our observation,

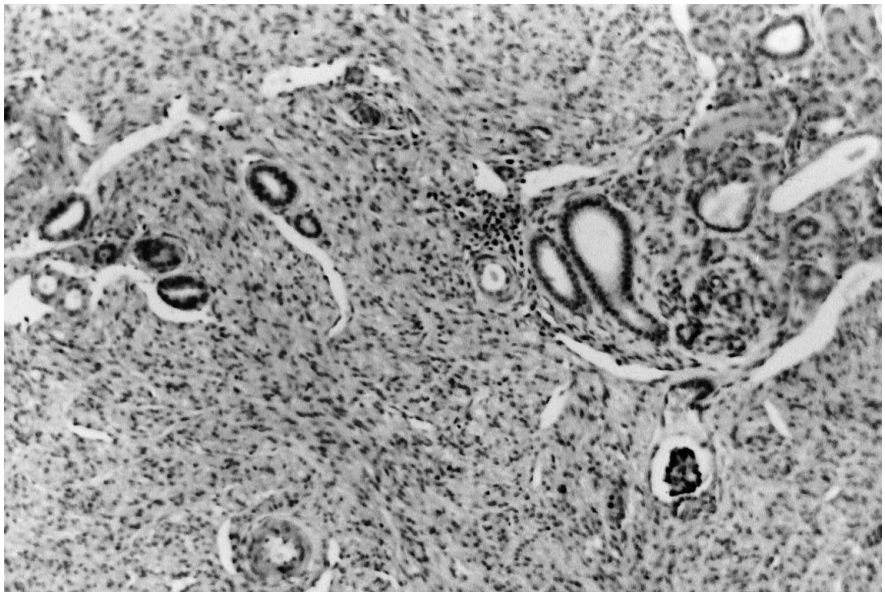

Fig. 3 Histological section of the kidney demonstrates fascicles of numerous spindle cells infiltrating the renal parenchyma. Some tubules and glomeruli are observed. The tumour is not encapsulated. There is no necrosis or cytological abnormality (haematoxylin and eosin, × 100)

a more recent MRI technique, the HASTE sequence, was used as it provides high-resolution T2-weighted images in only 2 s and enables fetal imaging without sedation. MRI allowed us to differentiate the solid mass from simple enlargement of the kidney, which was difficult on US. It enabled us to evaluate tumour size and gross composition, but it was less useful for assessing local and regional extent. In the report by Toma et al. [3], however, MRI was found to be better at defining the relationship of the tumour to adjacent structures than for determining the origin of the mass. The role of MRI in fetal abdominal imaging still needs to be evaluated. In our case, it helped us to take the decision, together with the parents, to let the pregnancy follow its course due to the good prognosis of mesoblastic nephroma.

Obstetric and neonatal complications

Mesoblastic nephroma is frequently associated with polyhydramnios and consequently with premature labour. All 20 cases presented with polyhydramnios except our observation. Thirteen cases were delivered before 38 weeks' gestation. The pathogenesis of polyhydramnios is still debated; usually there is no underlying maternal cause. Some authors suggest that compression of the fetal gastrointestinal tract by a large tumour may diminish the absorption of amniotic fluid; DiMaggio Howey et al. [6] described significant displacement of stomach and bowel loops on radiography. Haddad et al. [9] reported unsuccessful enteral nutrition due to vomiting. Another possible cause is excessive fetal urine production. Obmichi et al. [10] determined, ultrasonographically, the hourly fetal urine production. This rate was higher than normal and improved only after nephrectomy. The authors recommended close follow-up of fetal urine production for the postnatal assessment of haemodynamic changes and water and electrolyte balance. Polyuria might be related to hypercalcaemia or increased fetal renal blood flow [11].

Three cases of hydrops fetalis, all with fatal outcome, have been reported, of which one was diagnosed prenatally [12].

Tumour haemorrhage, confirmed in the neonatal period, was suspected in utero by Sailer et al. [13] because of rapid enlargement of the mass and aortic flow acceleration at Doppler evaluation. Matsumura et al. [8] report a case of tumour rupture 2 days after birth, which required emergency surgery and postoperative intensive care. This may have been caused by increased internal pressure within the tumour due to haemorrhage, obliteration of venous return and palpation of the neonate's abdomen.

Conclusion

Fetal renal neoplasms are rare. Mesoblastic nephroma is statistically the most probable diagnosis. Its carcinogenic prognosis is favourable. However, early detection and close follow-up with US are recommended to facilitate management and prevent complications. MRI can provide valuable information about the origin and nature of a fetal abdominal mass.

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