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MRI of Abdominal Masses in the Fetus

Fetal Taskforce Session ESPR 2022

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Conflicts of Interest

There are no conflicts of interest to declare

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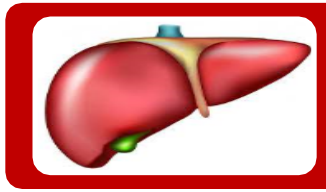
ABDOMINAL AND PELVIC MASSES IN THE FETUS

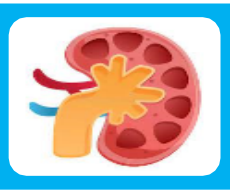
- Relatively rare (2-14 per 100.000 births)
- High morbidity in the foetus and new-born
- Failure of cellular differentiation and maturation during embryonal and foetal life
- Prenatal diagnosis based on US. MRI complementary tool to locate the tumour and narrow the diagnosis
- Cystic abdominal masses are common, solid are rare

FETAL MASSES IN ABDOMEN AND PELVIS



LIVER

- SOLID: HEMANGIOMA, HEPATOBLASTOMA, METASTASIS (NEUROBLASTOMA)
- CYSTIC: CHOLEDOCHAL CYST, MESENCHyMAL HAMARTOMA

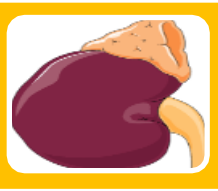


KIDNEY

- SOLID: MESOBLASTIC NEPHROMA
- CYSTIC: RENAL CYST, URINOMA

PELVIS

- SOLID: SACRO-COCCYGEAL TERATOMA
- CYSTIC: OVARIAN CYST/TORSION, URETEROCELE, LYMPHATIC MALFORMATION



ADRENAL

HAEMORRHAGE, NEUROBLASTOMA, HYPERPLASIA

GASTROINTESTINAL

MECONIUM PSEUDOCYST

DUPLICATION CYST

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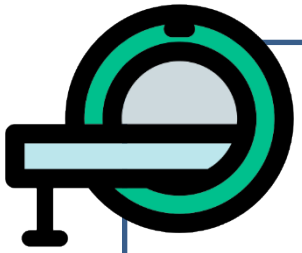
HEPATIC

HEMANGIOMA

- Solid and cystic
- May have calcifications (50%)
- Prominent vascularity
- Multifocal
- Can grow rapidly in utero
- Investigate cardiac function

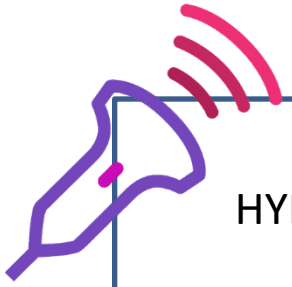


HYPOINTENSE T1

HYPERINTENSE T2

FLOW VOIDS

EARLY PHERIPHERAL ENHANCMENT AND PROGRESSIVE CENTRIPETAL FILLING



HYPO / HYPERECHOIC / MIXED

HIGH FLOW

PROMINENT VASCULAR STRUCTURES

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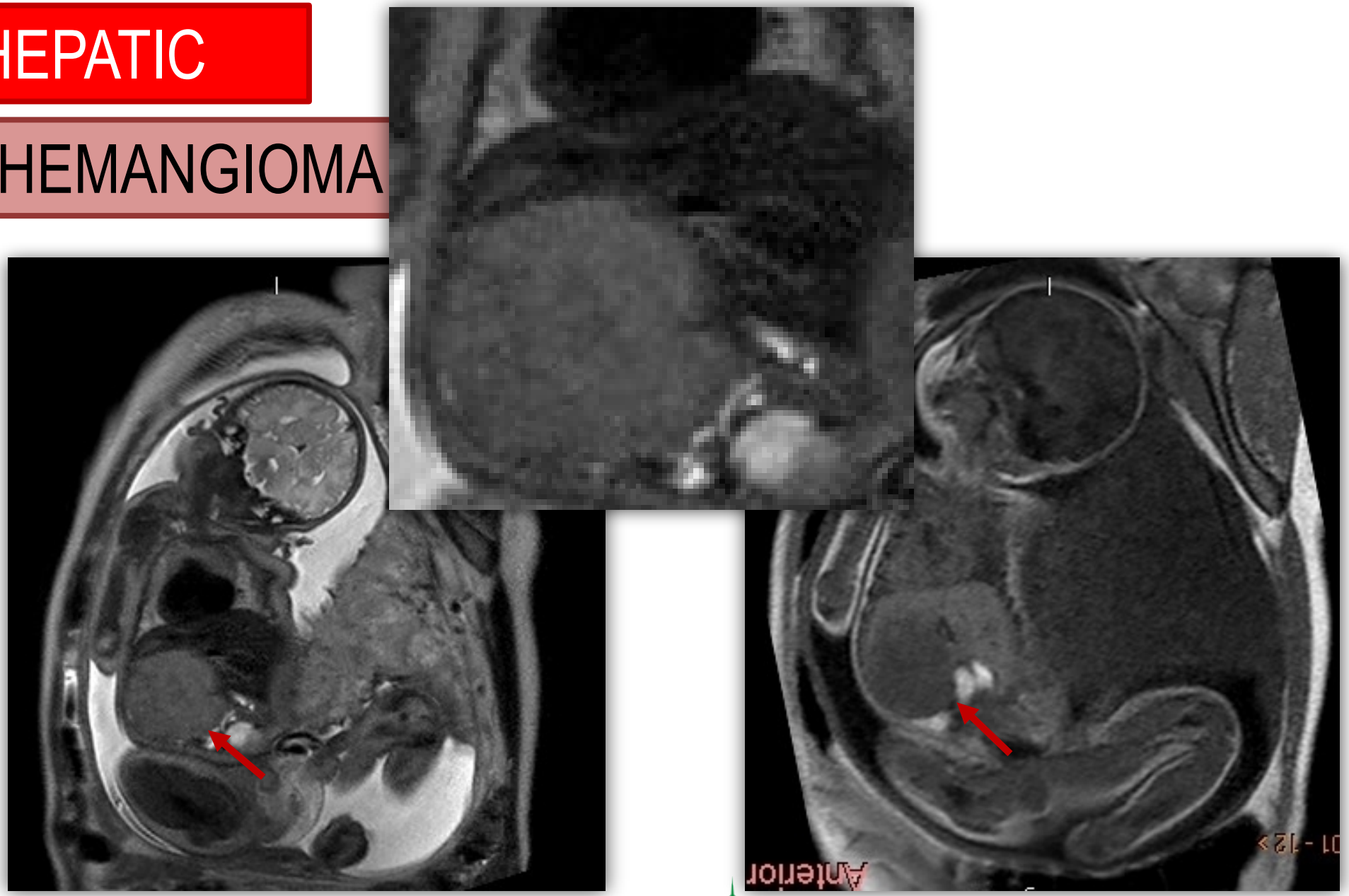
HEPATIC

HEMANGIOMA



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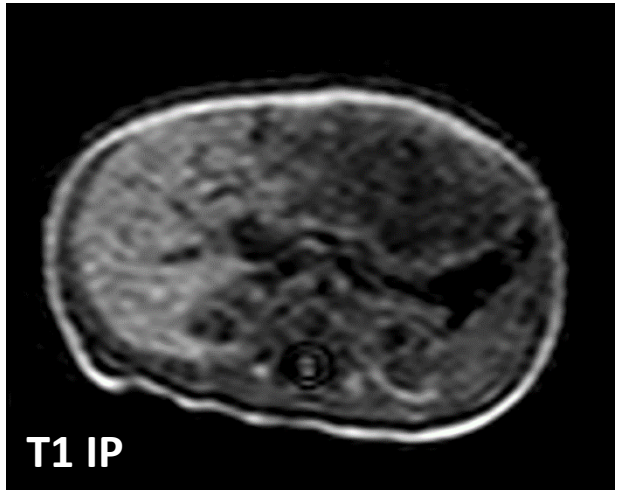
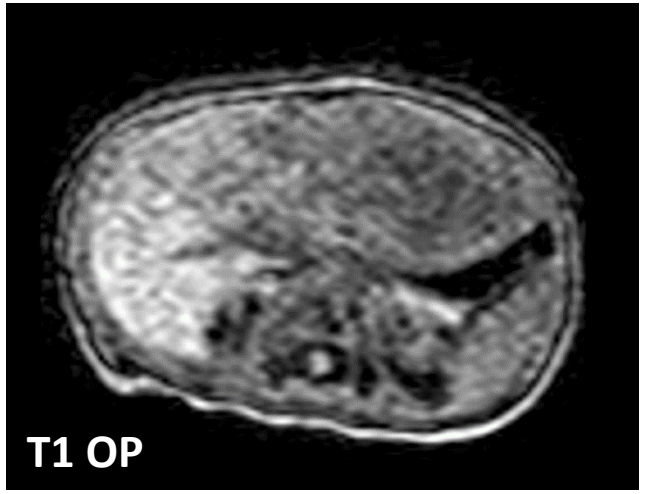
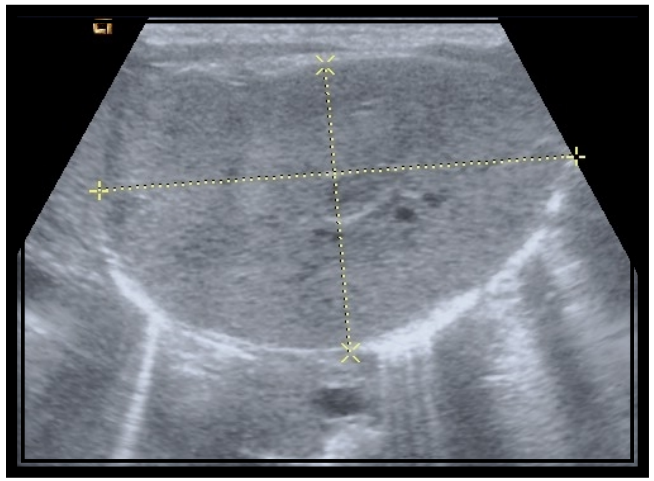
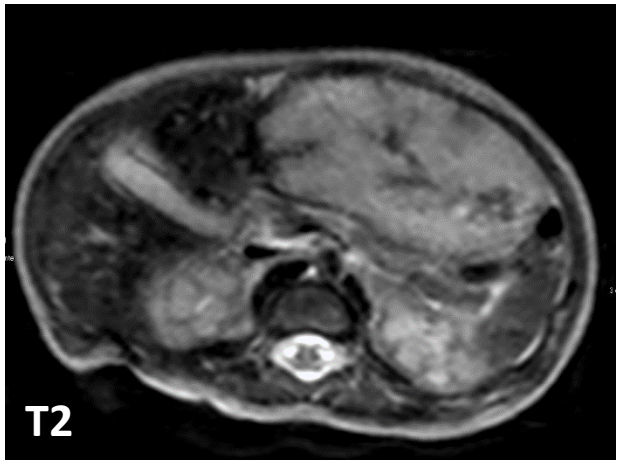
HEPATIC

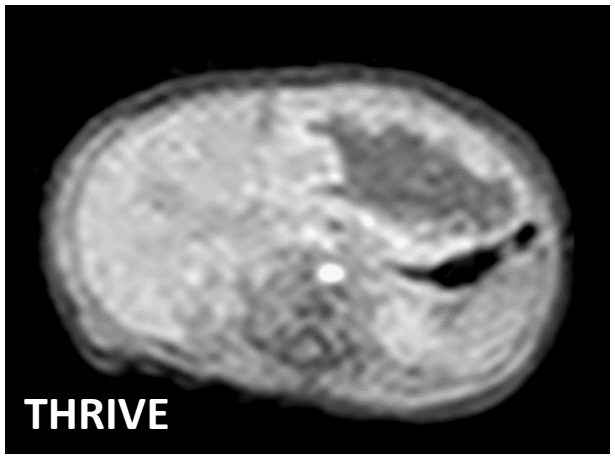
HEMANGIOMA











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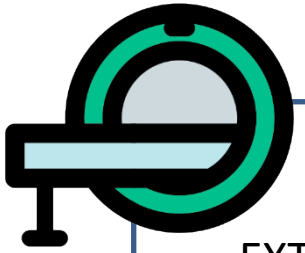
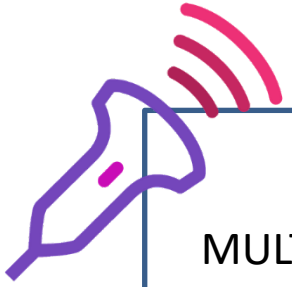
HEPATIC

MESENCHYMAL HAMARTOMA

- Benign proliferation of mesenchymal hepatic tissue
- Cystic tumor
- Can be associated with Beckwith-Wiedemann syndrome
- On rare ocasions, can be associated with placental mesenchymal dysplasia



EXTENSIVE CYSTIC COMPONENT
(HYPOINTENSE T1, HYPERINTENSE T2, NO DWI RESTRICTION)
MULTIFOCALITY



MULTISEPTATED CYSTIC LESION WITH SOLID COMPONENTS

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HEPATIC

MESENCHYMAL HAMARTOMA + PLACENTAL MESENCHYMAL DYSPLASIA

PRENATAL US WEEK 12

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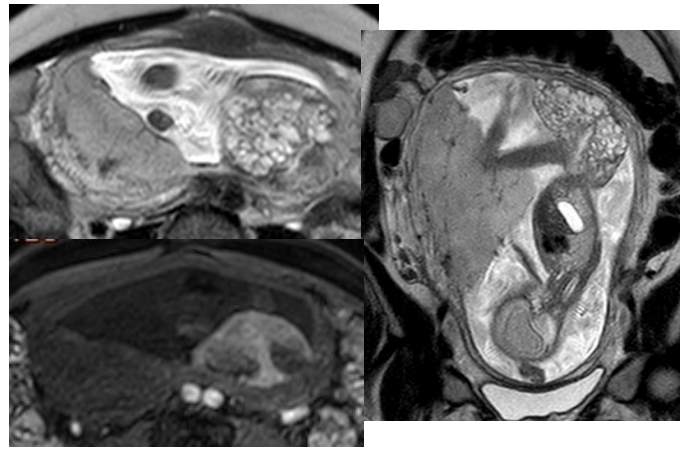
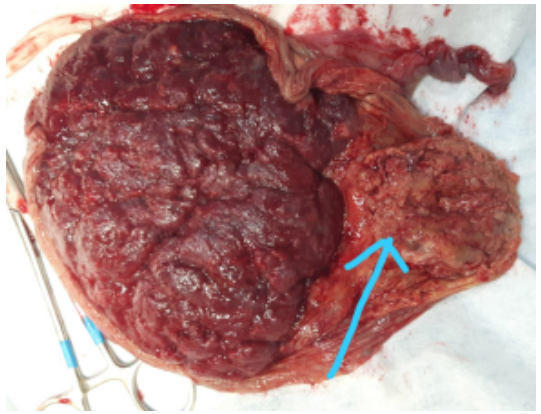
HEPATIC

MESENCHYMAL HAMARTOMA + PLACENTAL MESENCHYMAL DYSPLASIA

Partial Mole





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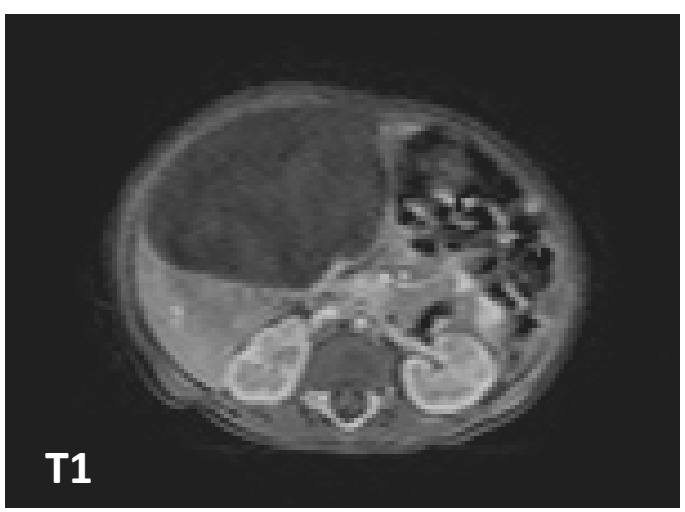
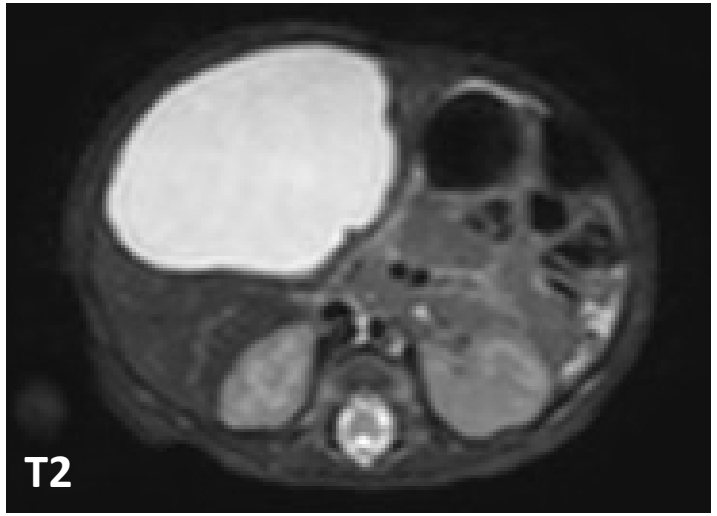
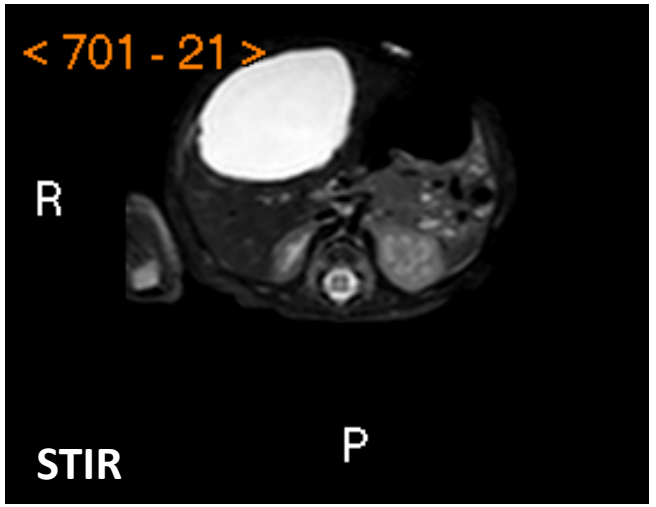
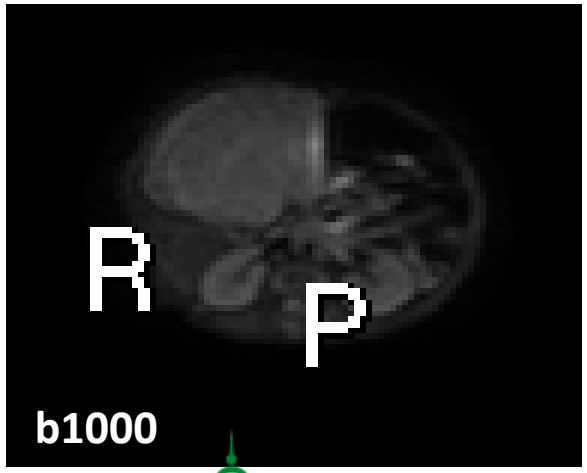
HEPATIC

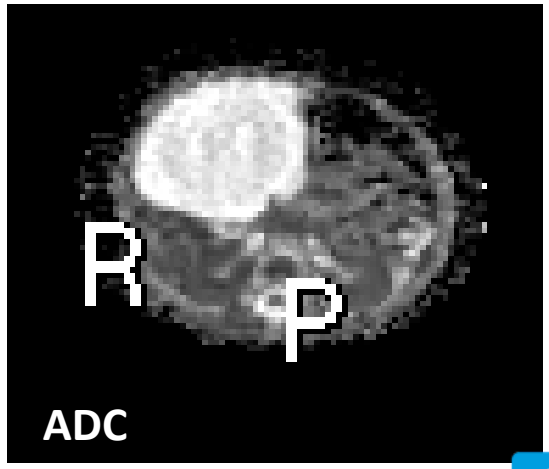
MESENCHYMAL HAMARTOMA + PLACENTAL MESENCHYMAL DYSPLASIA











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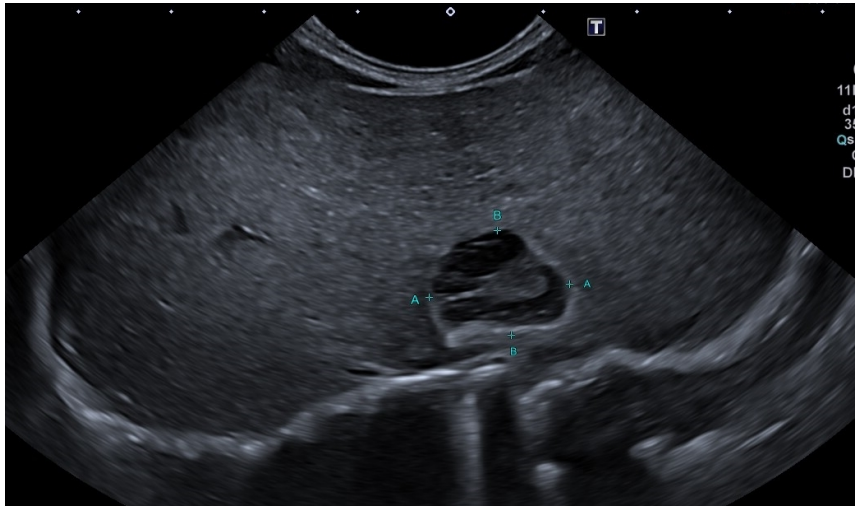
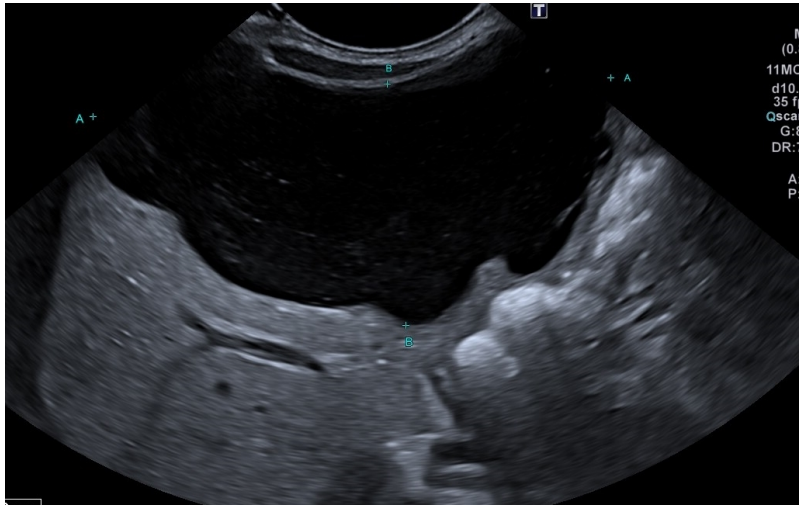
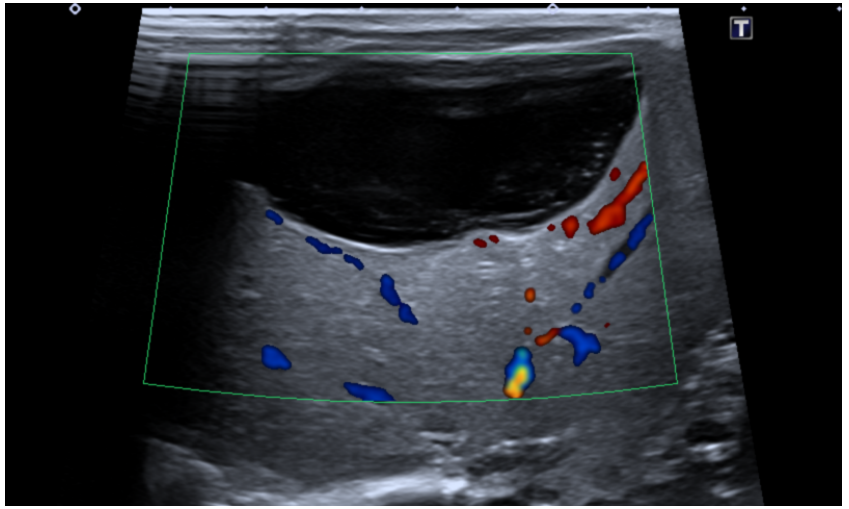
HEPATIC

MESENCHYMAL HAMARTOMA + PLACENTAL MESENCHYMAL DYSPLASIA







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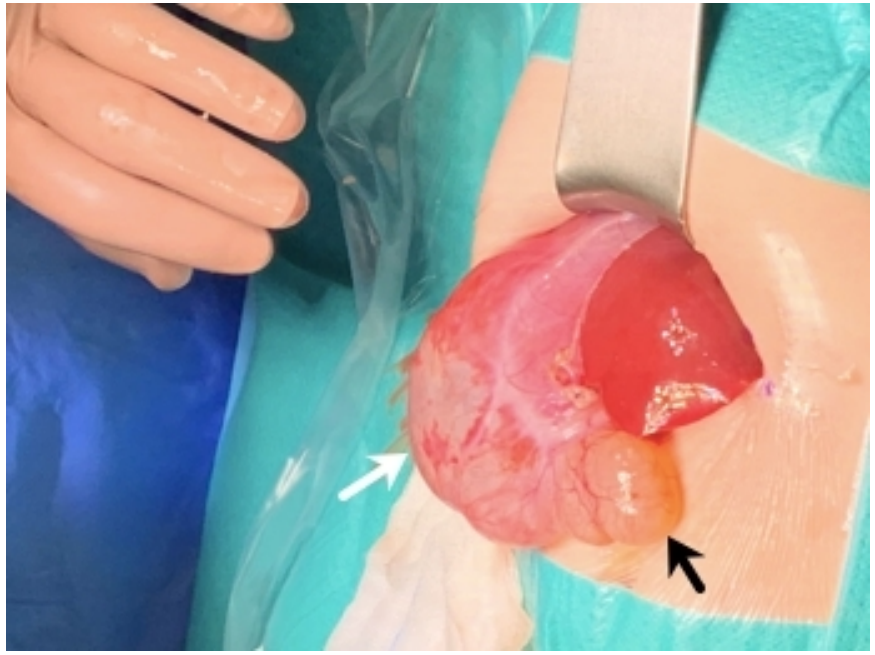

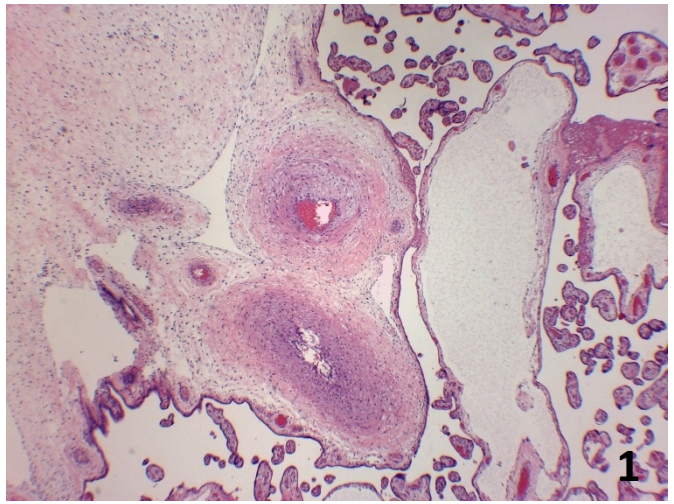

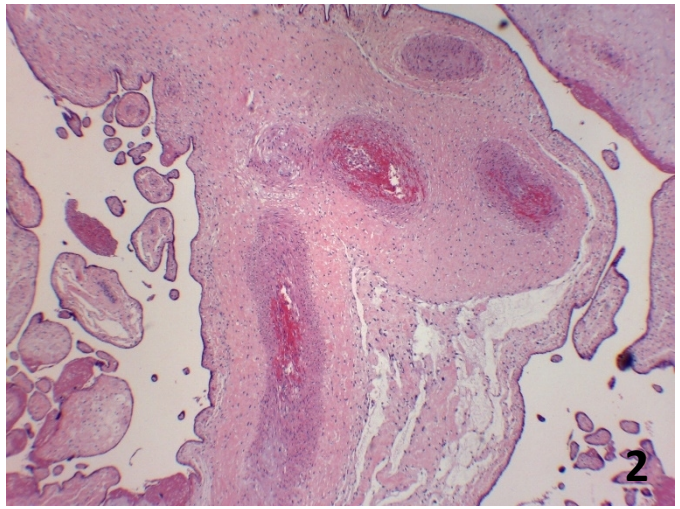

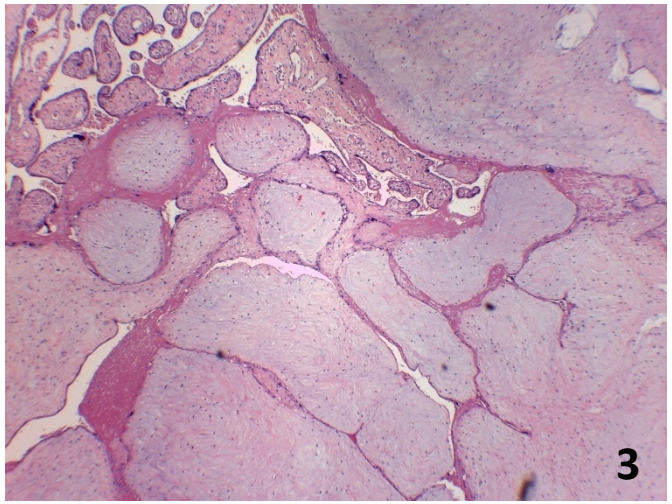

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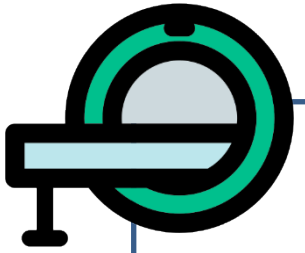
RENAL

MESOBLASTIC NEPHROMA

- Most frequent renal tumor in fetuses and neonates
- Non-encapsulated infiltrative renal mass
- Replace partially/totally renal parenchyma
- Frequently associated with polyhydramnios and hypercalcemia



ISO / HYPOINTENSE T1
HYPO TO HYPERINTENSE T2
DWI RESTRICTION
HETEROGENEOUS ENHANCEMENT

WELL DEFINED MASS WITH
HOMOGENEOUS LOW ECHOGENICITY
+/- CYSTIC/NECROTIC COMPONENT

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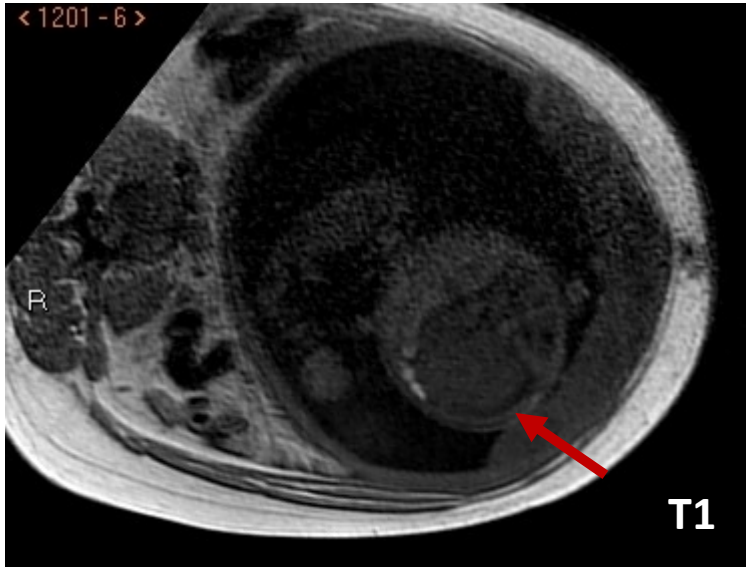
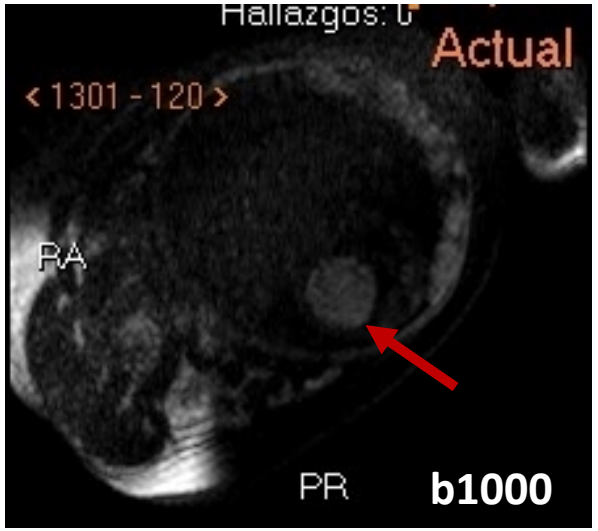
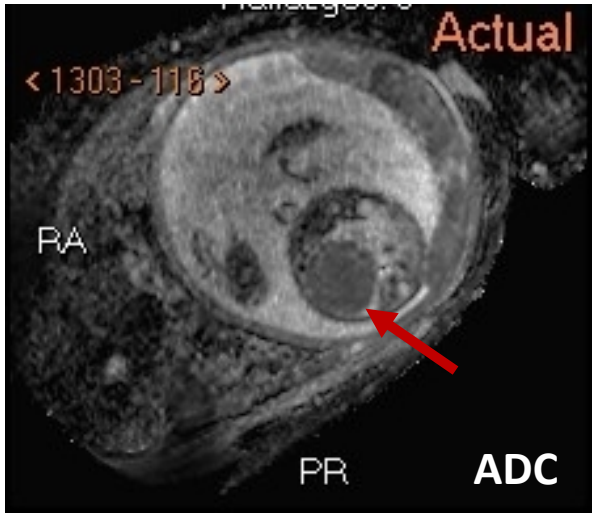
RENAL

MESOBLASTIC NEPHROMA







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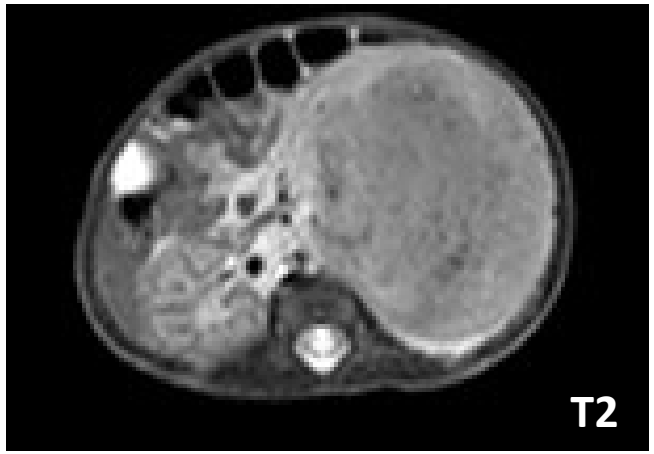
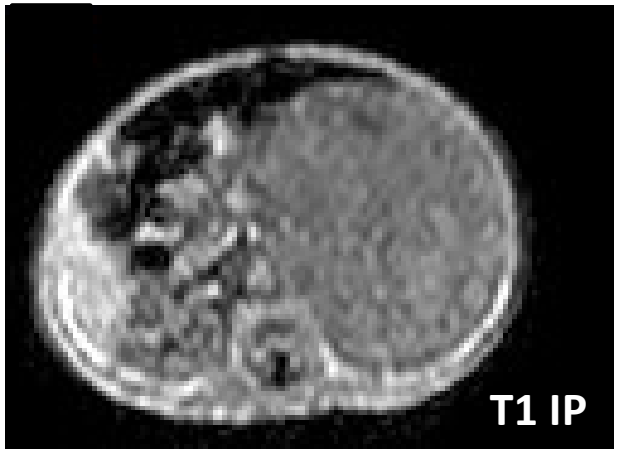
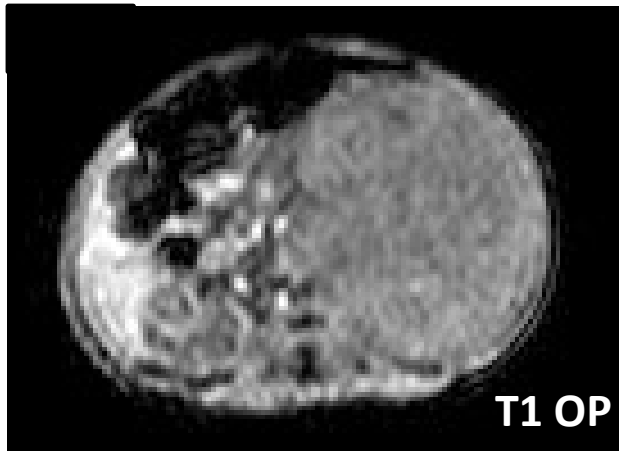
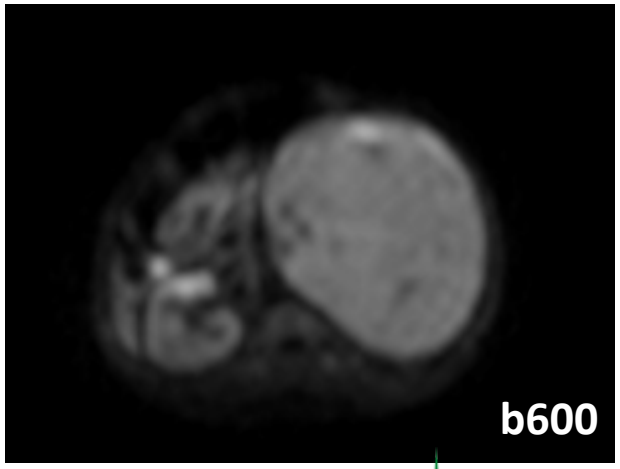
RENAL

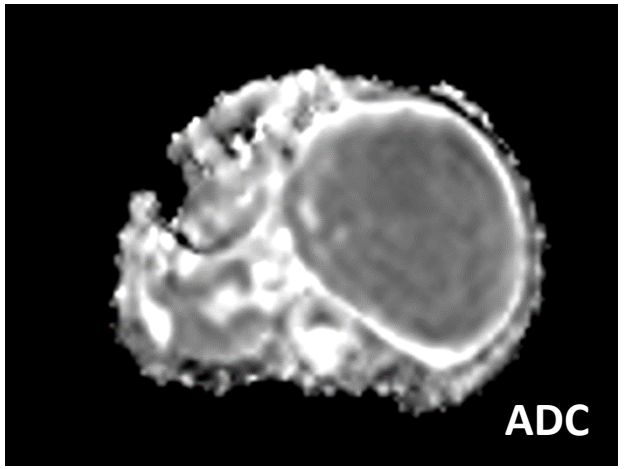
MESOBLASTIC NEPHROMA











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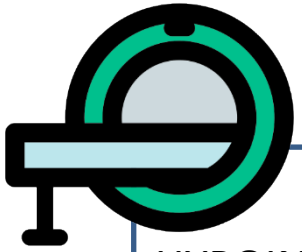
RENAL

CYSTIC MASSES

RENAL CYSTS



HYPOINTENSE T1, HYPERINTENSE T2, NO DWI RESTRICTION

URETEROPELVIC JUNCTION (UPJ) OBSTRUCTION

ANECHOIC MASS WITH THIN WALL AND POSTERIOR ACOUSTIC ENHANCEMENT

RENAL

CYSTIC MASSES

RENAL CYST

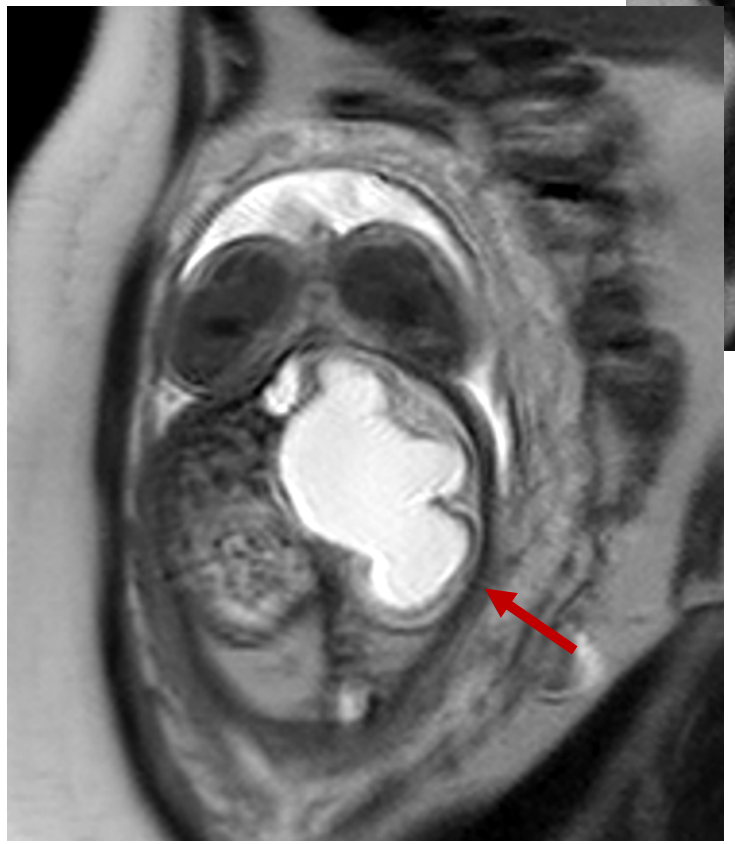
UPJ OBSTRUCTION

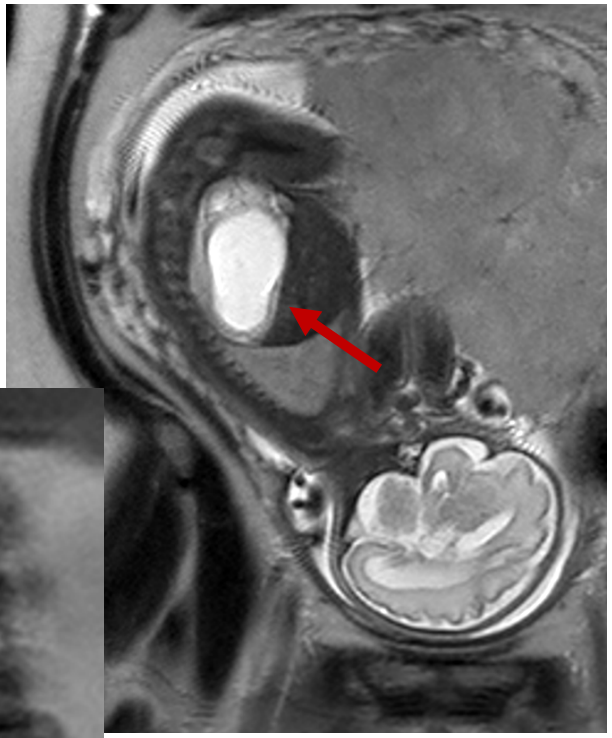
RENAL

CYSTIC MASSES

RENAL CYST

UPJ OBSTRUCTION





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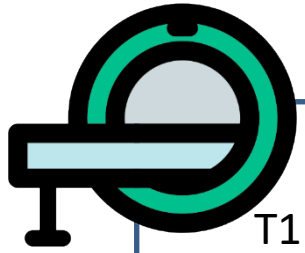
PELVIC

SACROCOCCYGEAL TERATOMA

- Teratoma: “monstrous tumor” (Greek)
- Most frequent congenital neoplasm (1/40.000). F:M = 4:1
- Solid and cystic components:
  - Mature and immature elements
  - Coccyx always involved
  - Sporadic and isolated
- Correlation between contents (solid and hypervascularized worst prognosis) and extension (worst if intrapelvic extension) and prognosis



T1: FAT HYPER, CALCIUM HYPO
T2: CYST HYPER
GRE: BLOOMING CALCIUM
T1 WITH CONTRAST: ENHANCEMENT SOLID PORTION

SOLID COMPONENT (ECHOGENIC MASS)
+/- CYSTIC (MORE MATURE)

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PELVIC

SACROCOCCYGEAL TERATOMA

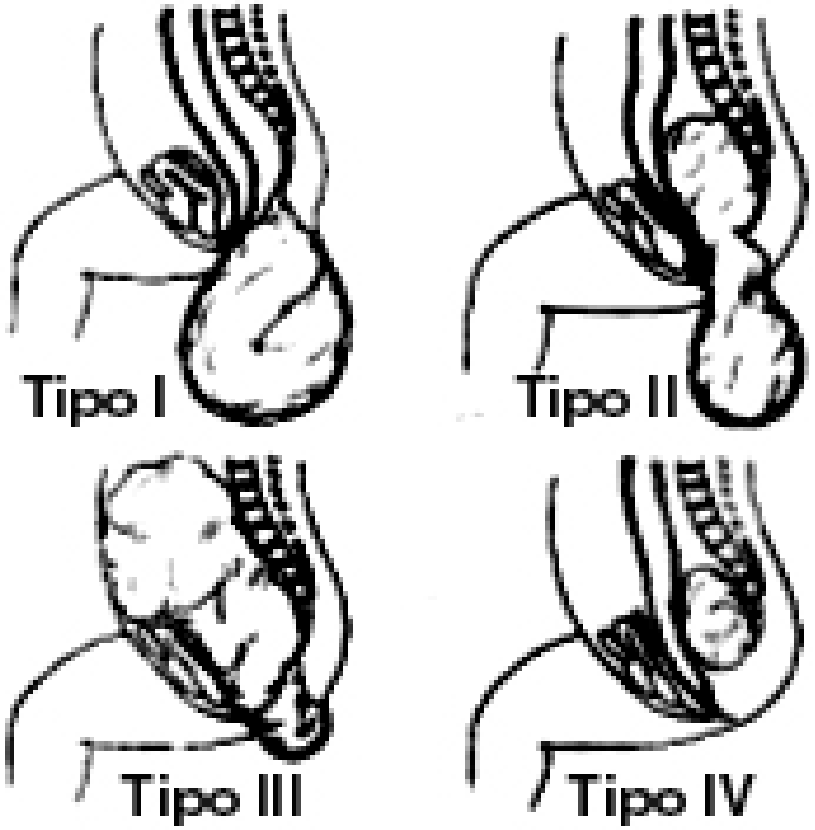
- Altman Classification:

  Type I : predominantly external

  Type II: predominantly external, small intrapelvic component

  Type III: external and internal, predominantly internal

  Type IV: internal



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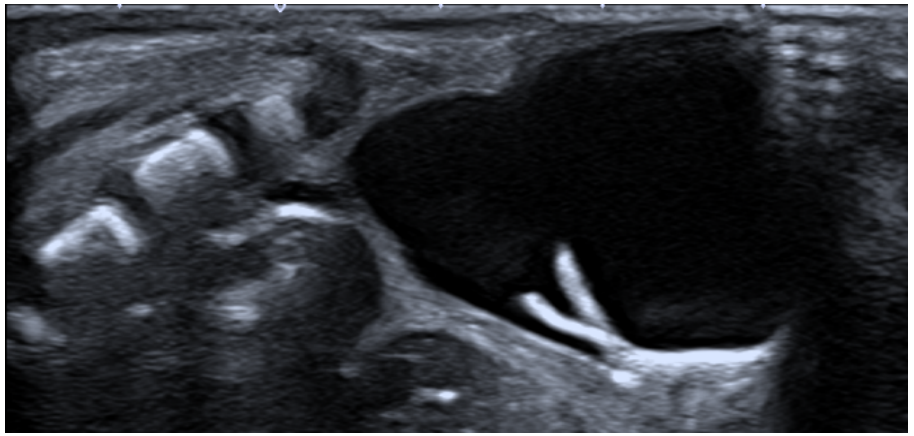
PELVIC

SACROCOCCYGEAL TERATOMA

TYPE II



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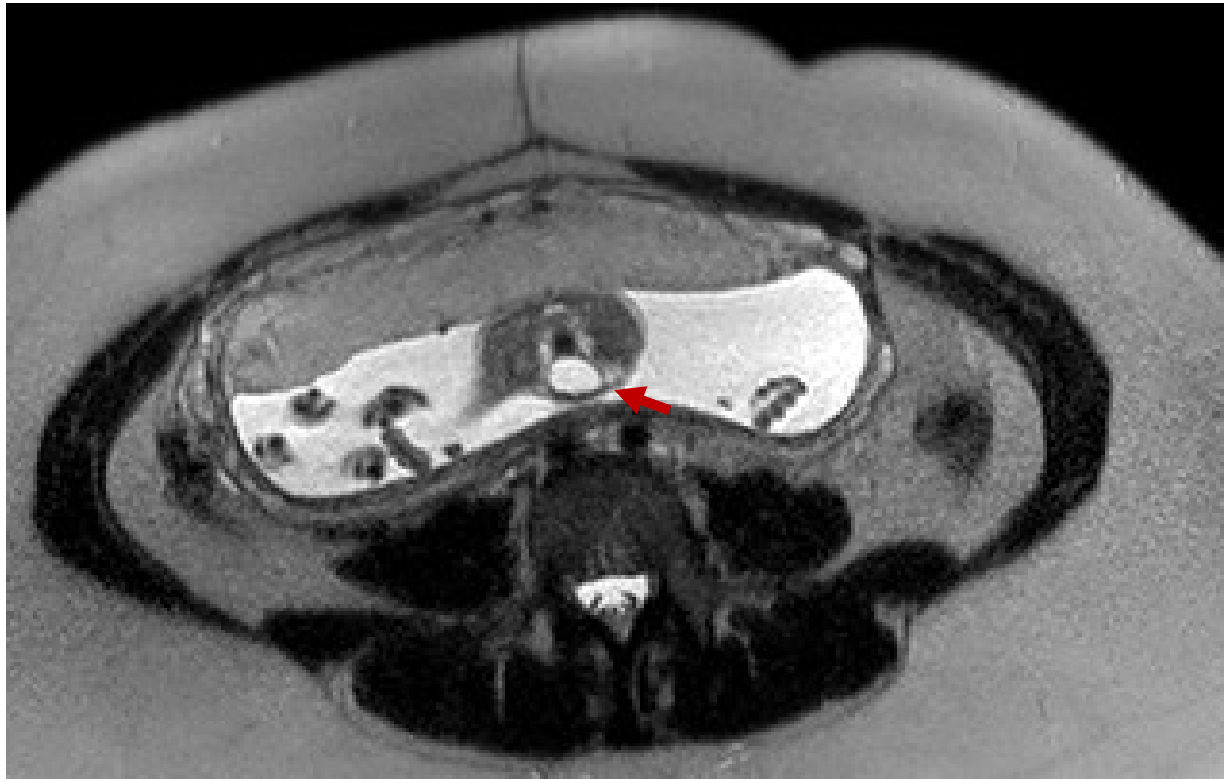
PELVIC

SACROCOCCYGEAL TERATOMA



PELVIC

SACROCOCCYGEAL TERATOMA

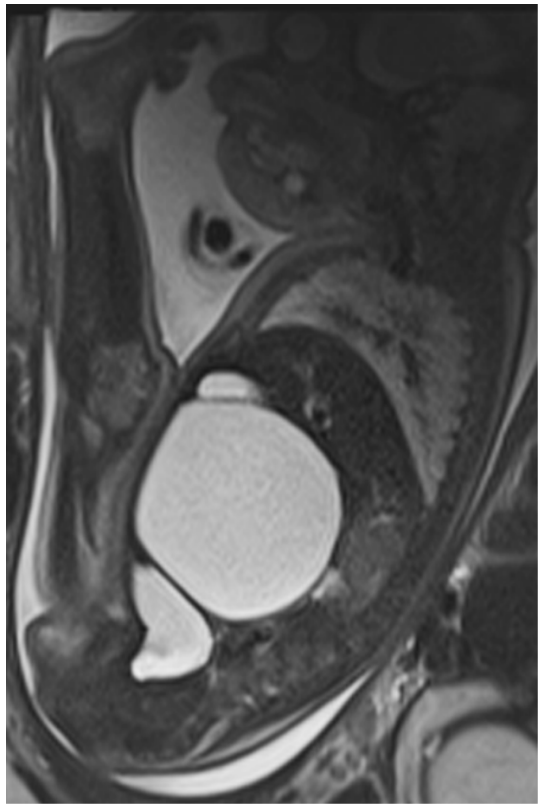
- Complications. Look for signs of decompensation:
  - Fast growth
  - Cardiac overload
  - Tumoral Hemorrhage
  - Placentomegalia
  - Polyhydramnios
  - Hydrops fetal

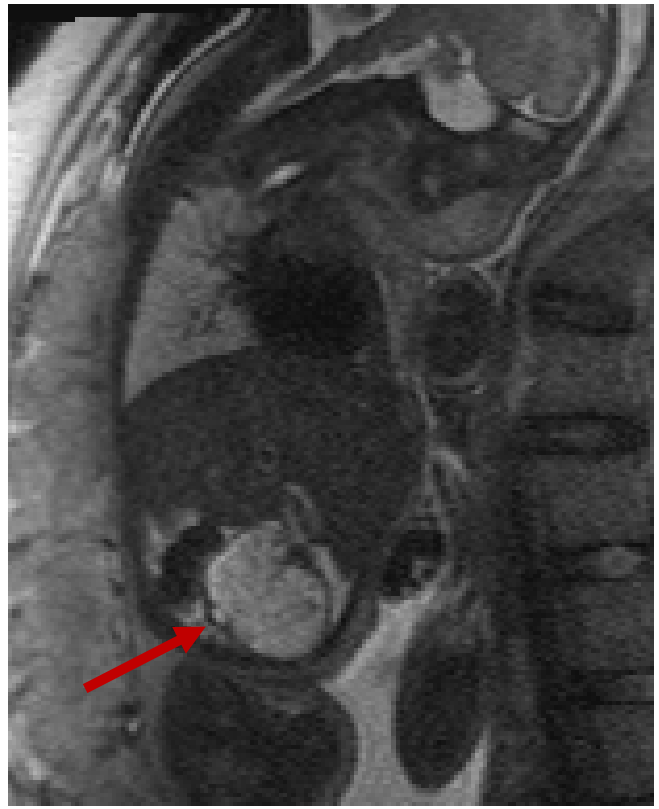
PELVIC

OVARIAN CYST

- Most frequent abdominal lesion female fetus (3rd trimester), majority disappear

- Simple ovarian cysts:
  - Round, anechoic
  - Unilocular
  - Thin-walled
  - Unilateral>bilateral
  - Intraabdominal>intrapelvic
  - “Daughter cysts”: small cysts within the cyst





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PELVIC

OVARIAN CYST

❖ Signs of complication:

- Thick wall
- Heterogeneous signal
- Septa
- Internal Debris
- Fluid-fluid level
- Ovarian torsion

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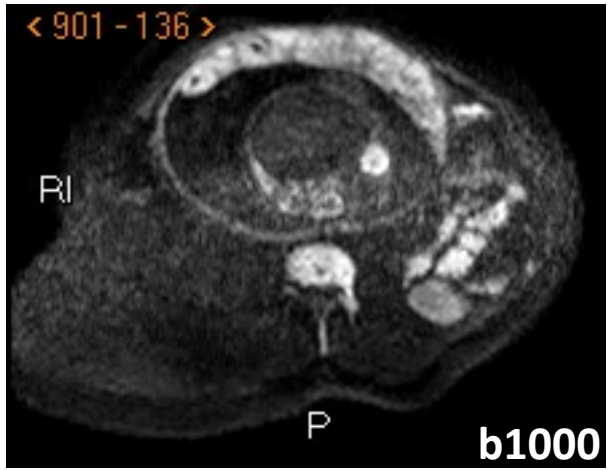
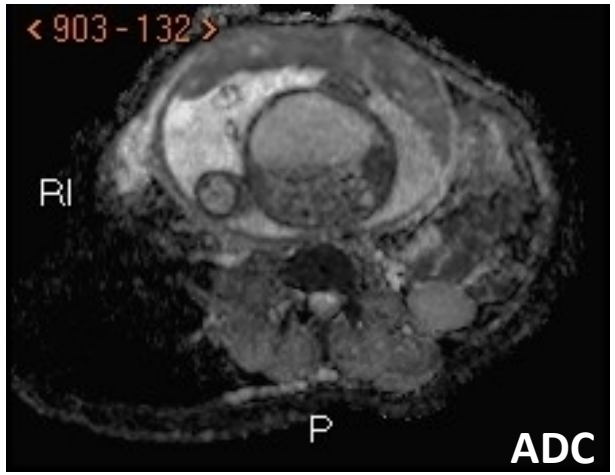
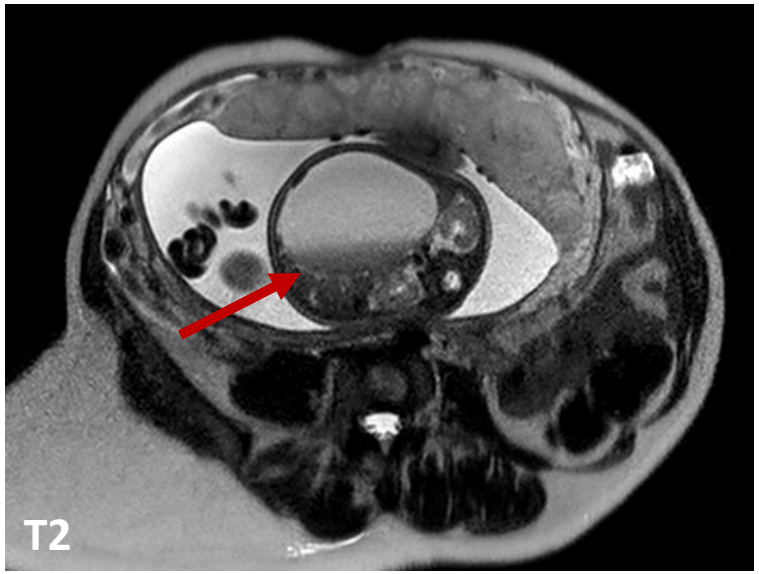
PELVIC

OVARIAN CYST







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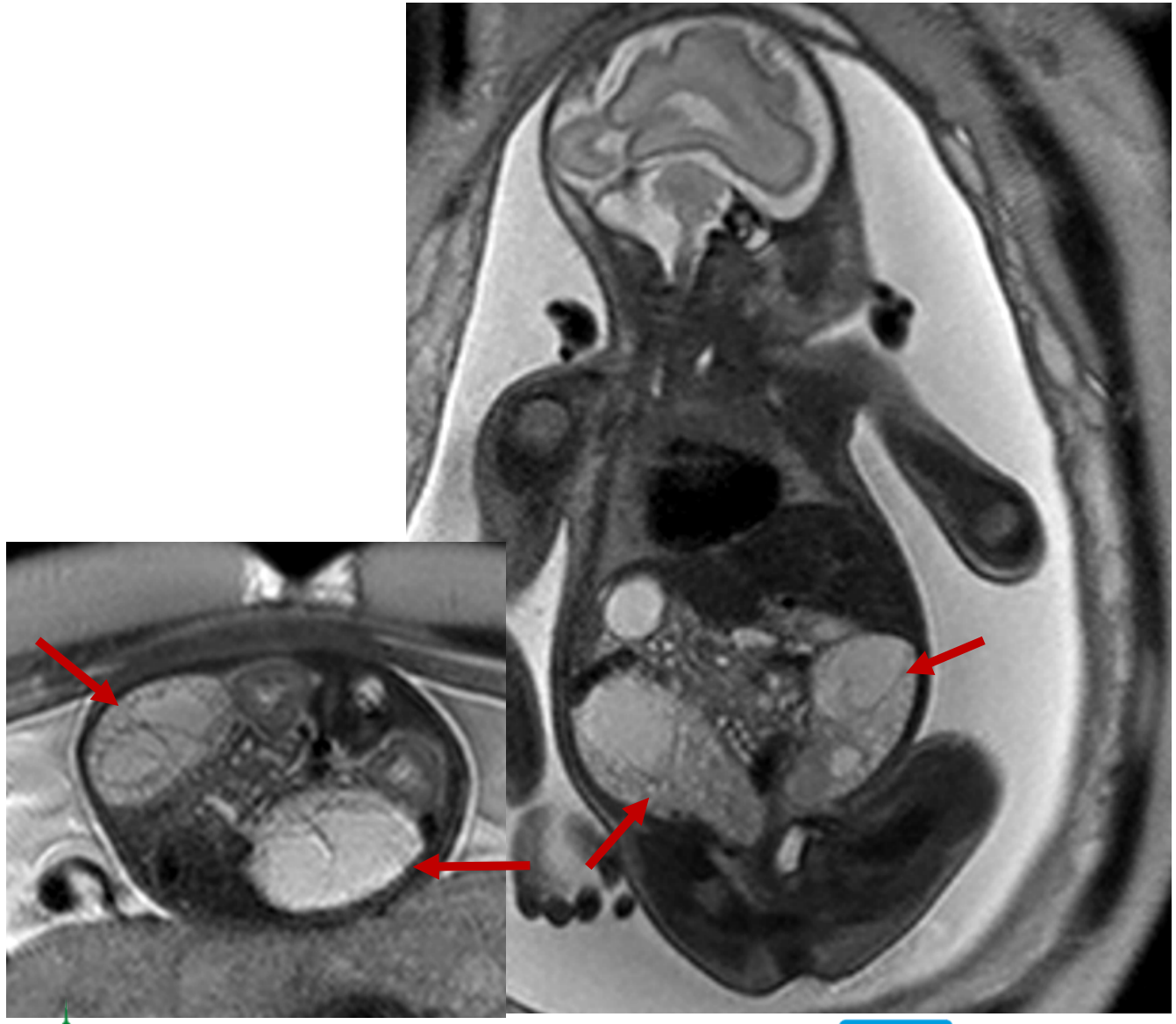
PELVIC

OVARIAN HYPERESTIMULATION SYNDROME

- Normally encountered after In Vitro Fertilization. It can appear spontaneously
- Bilateral symmetric enlargement of the ovaries. Multiple cysts of variable size “
- It can be associated with ascitis, pleural or pericardial effusion



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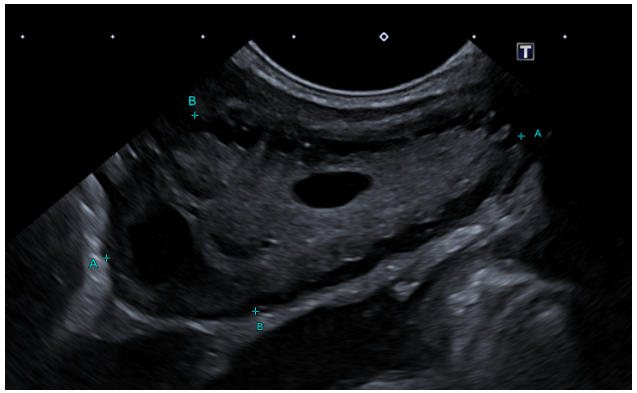
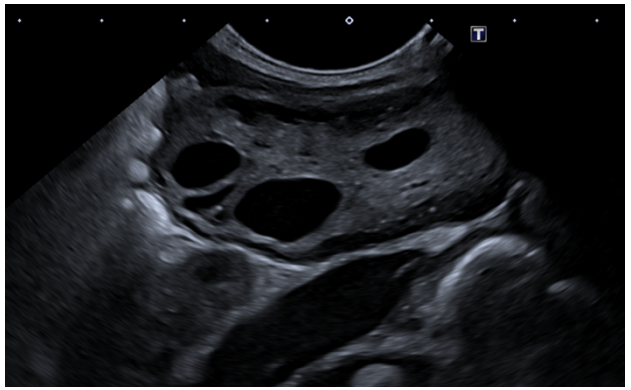
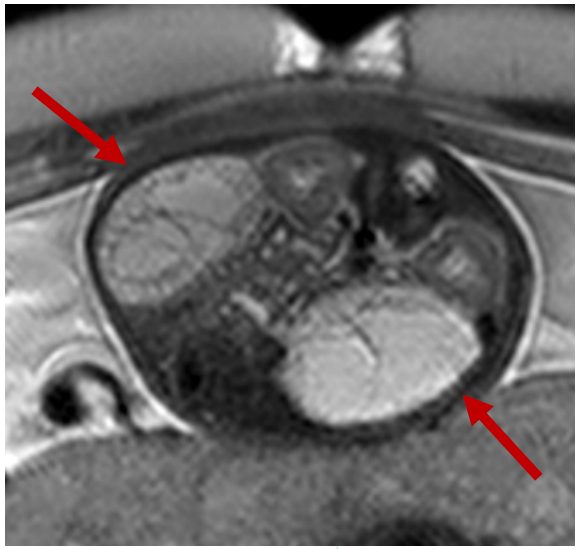
PELVIC

OVARIAN HYPERESTIMULATION SYNDROME







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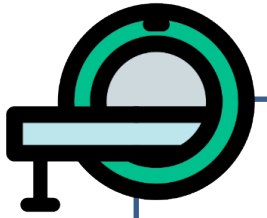
ADRENAL

NEUROBLASTOMA

- Most common perinatal mass in the perinatal period
- Embryonic tumor of the peripheral sympathetic nervous system
- Adrenal origin 90% (only 35% of postnatal cases)
- Usually isolated
- Metastasis very rare (liver)
- Most, favorable staging/histopathologic features
- Spontaneous regression in the 1st year of life



HYPOINTENSE T1
HYPERINTENSE T2
RESTRICTED DIFFUSION

HYPOECHOIC WELL-DEFINED MASS
CALCIFICATIONS RARE

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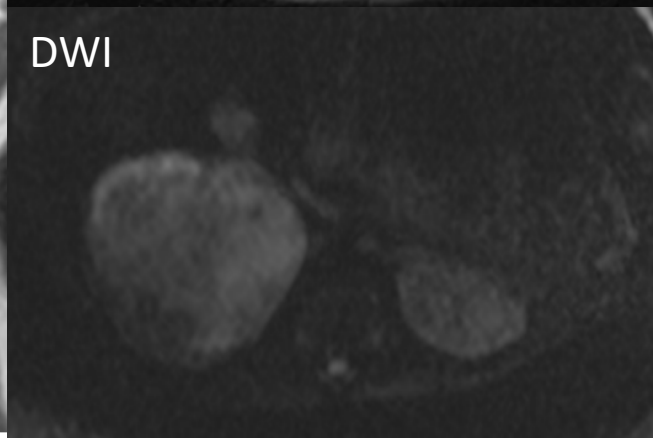
ADRENAL

NEUROBLASTOMA

DWI cannot differentiate from adrenal haemorrhage



Courtesy of Teresa Victoria

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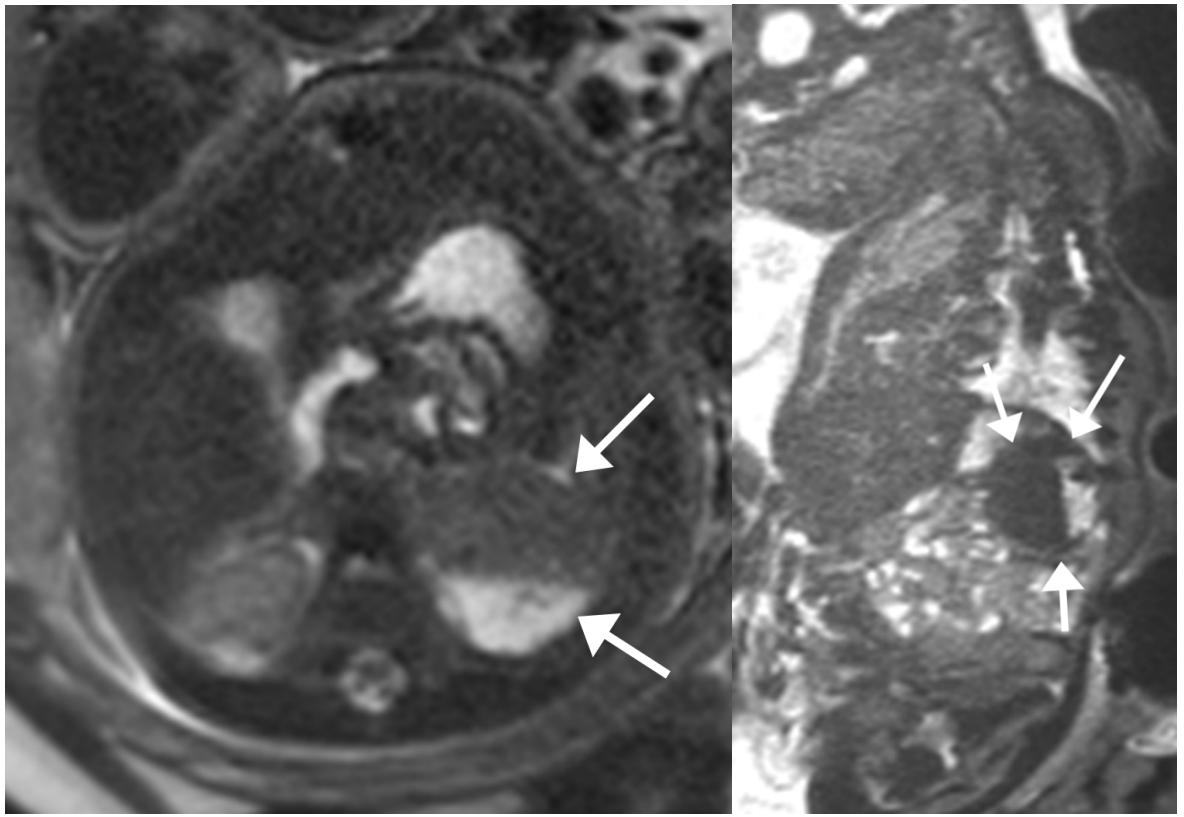
ADRENAL

HAEMORRAGHE

- mass mimicker, occurs more often than NB
- Adrenal gland, very vascular organ
- Hemorrhage may occur in the setting of stress, or as an isolated finding
- Other adrenal lesion: Extralobar sequestration



Courtesy of Teresa Victoria

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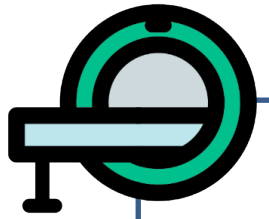
GI SYSTEM

MECONIUM PSEUDOCYST

- Rare entity
- Cystic cavity filled with meconium after a self-contained bowell perforation



HYPERINTENSE T1
HYPOINTENSE T2

HYPOECHOIC WELL-DEFINED MASS WITH A CALCIFIED THIN-WALL

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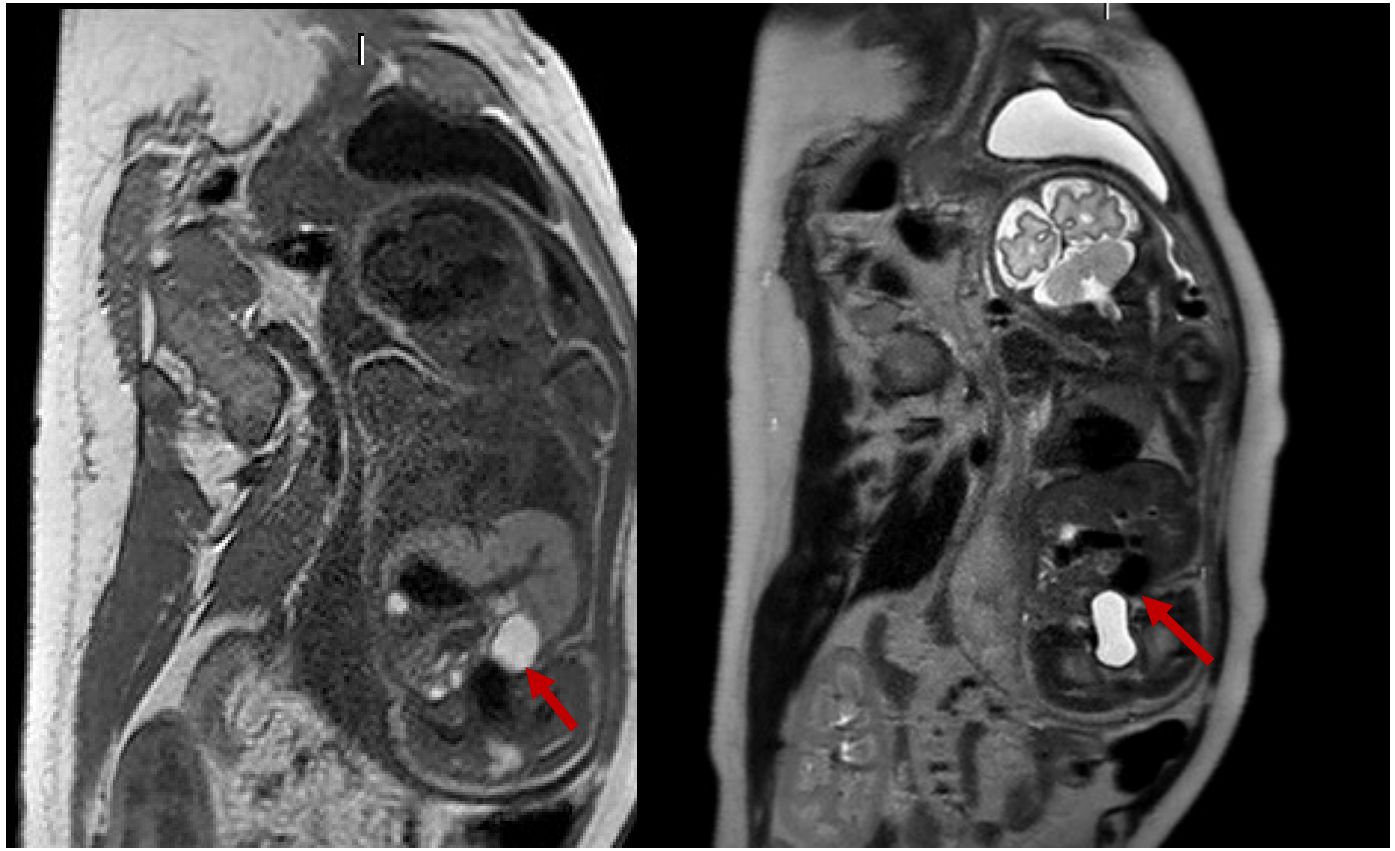
GI SYSTEM

MECONIUM PSEUDOCYST



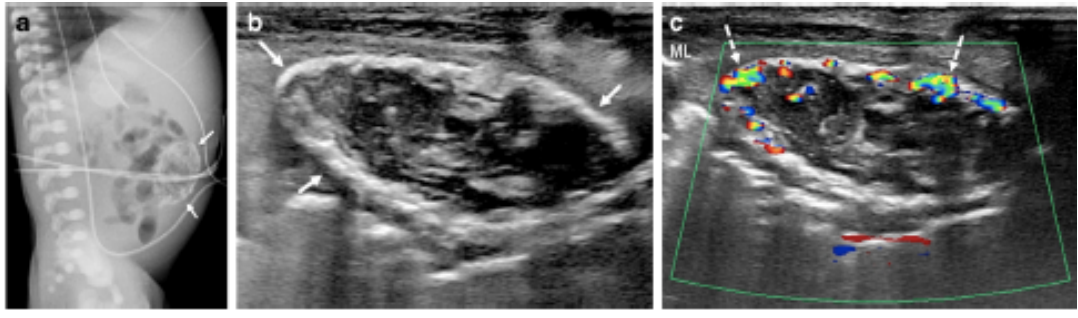


Table 2 Radiographic and sonographic findings in neonates with meconium peritonitis treated operatively and non-operatively

Findings on radiography		Non-operative group (n=14)	Operative group (n=23)	P-value
Calcifications	Diffuse peritoneal	9	12	NS
	Meconium pseudocyst	4	4	NS
Signs of obstruction		1	12	0.01
Pneumoperitoneum		0	1	NS
Ascites		0	3	NS
Findings on sonography		Non-operative group (n=14)	Operative group (n=23)	P-value
Calcifications	Diffuse peritoneal	11	11	NS
	Meconium pseudocyst	3	8	NS
Signs of obstruction		0	9	0.04
Pneumoperitoneum		0	3	NS
Ascites		0	7	0.01
Volvulus		0	1	NS

NS not significant. P-values <0.05 were considered statistically significant

HYPOECHOIC WELL-DEFINED MASS WITH A CALCIFIED THIN-WALL

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GI SYSTEM

GASTRIC DUPLICATION CYST

- Cyst adjacent to the GI tract
- Ileum > esophagus > colon > jejunum. Gastric < 10%
- Spherical cystic lesion, non-communicated, adjacent to the major curvature

TAKE HOME POINTS

- Prenatal diagnosis of abdominal masses is based on ultrasound
- MRI provides additional valuable information (location/characterization)
- Look for signs of foetal distress/ decompensation
- Postnatal confirmation is mandatory
- Future of prenatal imaging may include faster MRI sequences with improved tissue characterization and follow-up of in utero procedures

Thank You Gracias Merci



Collaborators:
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Dra. Teresa Victoria
Dr. Fred Avni

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