Fetal Abdomen Ultrasound

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Introduction

- Stomach
- Cord insert
- Bowel
- Kidneys
- Bladder

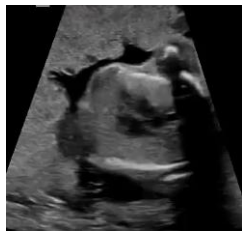
Ultrasound technique

Normal appearance

Pathology

Ultrasound technique

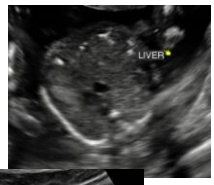
- Abdominal circumference
  - Transverse plane
  - Spine at 3:00 or 9:00
  - Symmetrical ribs
  - Stomach, umbilical vein
  - No kidneys



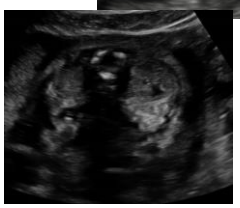
What are we checking?

- Is the situs correct?
- Is the stomach present?
- Is the AC a normal size?

Ultrasound technique

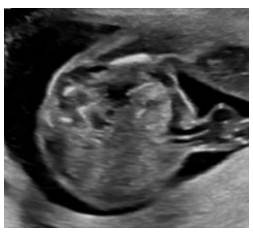


- Survey the abdomen in transverse from superior to inferior
- Look for:
  - Masses
  - Calcifications
  - Dilated or echogenic bowel
  - Ascites

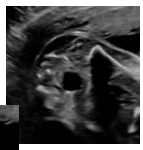


Ultrasound technique

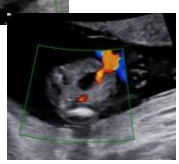
- Cord insertion
  - Spine at 3:00 or 9:00
  - Move transducer inferiorly (on fetus) from the AC plane
- Cord should insert perpendicular and midline to the abdomen
  - Have fluid on each side of cord insertion
- Look for:
  - Correct cord insertion site
  - Is the abdominal wall intact?
  - Any masses protruding from insertion site?



Ultrasound technique

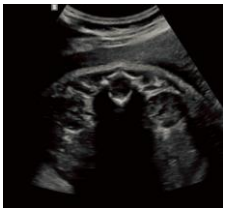


- Bladder
  - Move transducer inferiorly from cord insertion plane
  - Is there fluid in the bladder?
    - If not seen, come back to the bladder later on during examination
  - Normal size and shape?
- 3 vessel cord
  - Colour Doppler to show a 3 vessel cord
  - Look out for a 2VC
    - IUGR
    - Congenital and karyotypic abnormalities



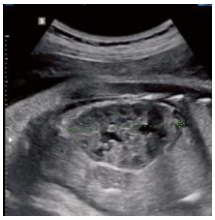
Ultasound technique

- Kidneys
  - Three plane assessment: transverse, sagittal and coronal
- Transverse: spine at 12:00 or 6:00
  - Right kidney situated slightly lower than left kidney
  - May need to rotate transducer slightly



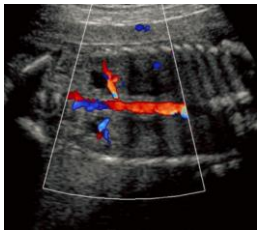
Ultasound technique

- Sagittal: From the transverse plane, turn the transducer 90°
  - Pan from left to right
  - Length of kidney approx. equals gestational age
    - e.g. 20/40 fetus should have approx. 20mm length kidneys



Ultasound technique

- Coronal: Transverse plane with spine at 3:00 or 9:00, then turn the transducer 90°
  - Can apply colour Doppler to check there are 2 renal arteries



Ultrasound technique

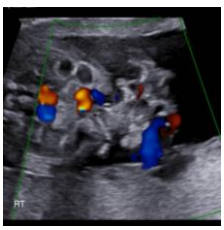
What to look for:

- Bladder: is it present? Normal size and appearance?
- Kidneys: present? Normal size and appearance? Correct number and position?
  - Look at their echogenicity
  - Any cysts or masses? If yes, is it unilateral or bilateral
- Dilation of collecting system
  - Is it present? If yes, is it unilateral or bilateral?
  - What level?
  - Can a cause be identified?

Pathology: Abdominal Wall

Gastroschisis

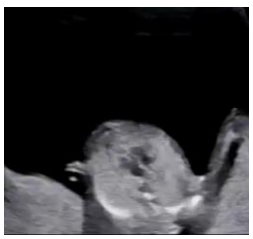
- NOT commonly associated with aneuploidy
- Associated GIT anomalies are common
- Increased risk of PTB and FGR
- Full-thickness defect in the anterior abdominal wall immediately right of the umbilical cord insertion
  - Very rarely on left side
- There is always a **normal** umbilical cord insertion



Pathology: Abdominal Wall

Gastroschisis

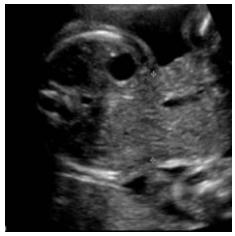
- **Ultrasound appearance:**
  - Small full-thickness abdominal wall defect
  - Hyperechoic mass attached to abdominal wall immediately right of umbilical cord insertion
  - Free-floating loops of bowel
  - **No** covering membrane
  - Thickened, echogenic and nodular bowel wall



Pathology: Abdominal Wall

Omphalocele

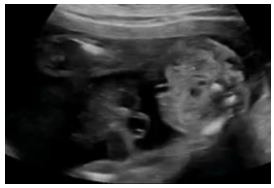
- Increased risk of aneuploidy and other non-GIT anomalies
- Membrane covered midline abdominal wall defect with herniation of abdominal contents
- The umbilical cord inserts into this sac
- Membrane rupture is a complication and can mimic gastroschisis



Pathology: Abdominal Wall

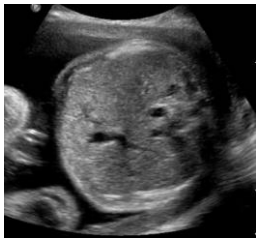
Omphalocele

- Must look for another abnormalities
  - Commonly associated with cardiac abnormalities
- **Ultrasound appearance:**
  - Smooth, midline abdominal wall mass with umbilical cord inserting into it
  - Liver and SB are common contents of this mass
  - Herniated bowel generally has normal appearance because it is covered by the membrane and has no contact with amniotic fluid



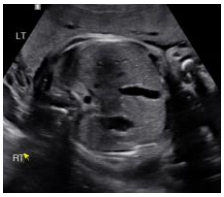
Pathology: Stomach

- Small or absent
  - Absent stomach is very rare
  - Allow time to see if stomach fills with fluid
  - Increases risk of fetal abnormality
- Dilated fetal stomach
  - Persistently dilated fetal stomach
  - May be normal or associated with a GI atresia



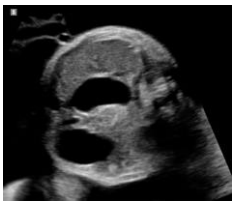
Pathology: Stomach

- Midline or right sided stomach
  - Malpositioned stomach
  - Check fetus' situs
    - ?heterotaxy ?CDH
- Esophageal atresia
  - Incomplete differentiation of respiratory and GI tracts
  - Small stomach, polyhydramnios, IUGR
  - "Pouch sign" – transient filling of esophagus with swallowing
  - Can be part of VACTERL sequence



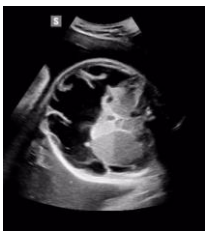
Pathology: Bowel

- Echogenic bowel
  - must be as bright as ossified bone
- Duodenal atresia
  - Congenital duodenal obstruction
  - Most common bowel obstruction in fetus
  - Persistent fluid in duodenum
  - "double bubble" sign – fluid filled stomach AND duodenum
  - Echogenic bowel



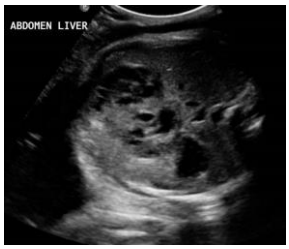
Pathology: Bowel

- Jejunal or ileal atresia
  - Jejunal > ileal
  - May not be diagnosed until T3
  - Bowel lumen diameter >7mm
  - Echogenic bowel
  - Dilated, fluid-filled loops of bowel



Pathology: Abdominal Masses

- Congenital Hepatic haemangioma
  - Benign vascular neoplasm occurring in viscera
  - Common in liver
  - Well defined, solid mass, peripheral vascularity
    - Areas of necrosis
- Mesenchymal hamartoma
  - Benign liver tumour composed of large cysts surrounded by mesenchymal tissue
  - Multiloculated, cystic liver mass
  - Has thin or thick septations
  - Avascular

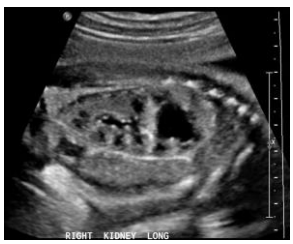


Pathology: Abdominal Masses

- Hepatoblastoma
  - Most common malignant liver tumour
  - Well defined, solid, echogenic mass
  - Displaces adjacent structures
  - Disorganised vascularity
- Follow up these fetuses with MCA and DV to predict fetal anaemia

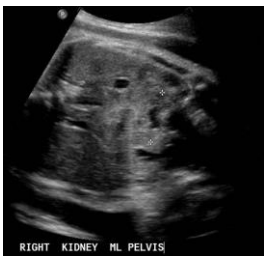
Renal pathology

- Duplex kidney
  - Two separate pelvicalyceal systems
  - Complete or partial duplication of ureters
  - UP obstructs and LP refluxes
- Horseshoe kidney
  - Fusion of LP of kidneys
  - Difficult to diagnosis antenatally



Renal pathology

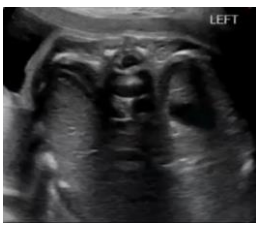
- Ectopic kidney
  - Abnormal position of kidney/s
  - Pelvis is the most common location
  - Hypoplastic or dysplastic
  - Empty renal fossa → ?ectopic kidney



Renal pathology

Renal agenesis

- Unilateral
  - AFI and bladder may be normal
  - Empty renal fossa (check it is not ectopic)
  - Compensatory hypertrophy of contralateral kidney
  - Isolated → good prognosis



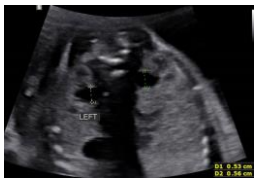
Renal pathology

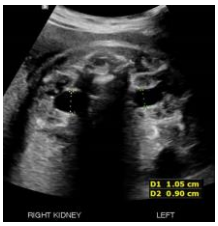
Renal agenesis

- Bilateral – incompatible with life
  - Failure of ureteric bud and nephrons to develop
  - Severe oligohydramnios
  - Non-visualisation of fetal bladder
  - "lying down" adrenal sign
  - Potter syndrome

Pathology: hydronephrosis

- Measure the transverse renal pelvis diameter
  - T2: >4mm
  - T3: >7mm



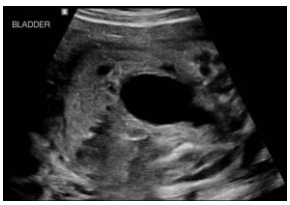


Pathology: hydronephrosis

- PUJ obstruction
  - Most common cause of neonatal hydronephrosis
  - Usually unilateral
  - Ultrasound: dilated renal pelvis +/- calyceal dilation; No ureter or bladder distension
- VUJ obstruction
  - Structural anomaly of distal ureter causing obstruction
  - Ultrasound: dilated ureter +/- dilated renal pelvis

Pathology: hydronephrosis

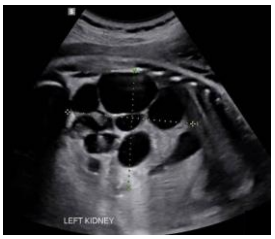
- PUV
  - Most common cause of lower urinary tract obstruction
  - Males
  - Persistently dilated bladder and proximal ureter, known as "keyhole" sign
  - Trabeculated and thick bladder wall
  - Can cause hydronephrosis



Renal cystic disease

Multicystic Dysplastic Kidney (MCDK)

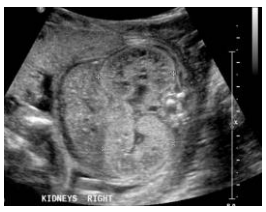
- Most common
- Kidney replaced by cysts of variable size
- No normal renal parenchyma
- Non-functioning
- Most are unilateral
- Ultrasound: multiple cysts seen in kidney
  - Kidney can appear hyperechoic
  - If bilateral: severe oligohydramnios, non-visualisation of bladder



Renal cystic disease

Autosomal Recessive Polycystic Kidney Disease (ARPKD)

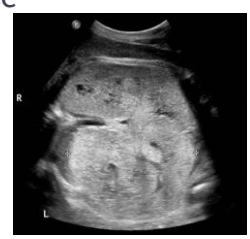
- Single gene disorder
- Bilateral, symmetrical, cystic renal disease
- Numerous tiny cysts



Renal cystic disease

Autosomal Recessive Polycystic Kidney Disease (ARPKD)

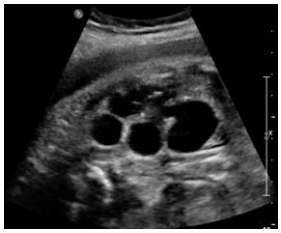
- Ultrasound:
  - Hyperechoic and enlarged kidneys
  - Decreased C-M differentiation
  - Can be difficult to Dx antenatally



Renal cystic disease

Autosomal Dominant Polycystic Kidney Disease (ADPKD)

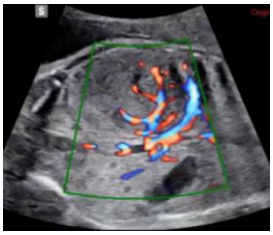
- Hereditary
- Cysts form in kidneys and liver
- Antenatally, the kidneys may appear normal
- Normal AFI and bladder
- FHx is critical to diagnosing ADPKD



Renal Masses

Mesoblastic Nephroma

- Most common
- Benign hamartoma
- Ultrasound appearance:
  - Solid renal mass
  - Polyhydramnios
  - Iso to hyperechoic compared with renal parenchyma
  - Peripheral and internal vascularity



Renal Masses

Wilm's Tumour

- Rare malignant tumour
- Indistinguishable from mesoblastic nephroma
- Ultrasound: echogenic, solid mass
  - Can replace entire kidney
  - Marked internal vascularity
  - May have cystic spaces

Adrenal Glands

Neuroblastoma

- Most common abdominal malignancy
- Ultrasound appearance:
  - No normal adrenal gland
  - Solid, cystic, or mixed
  - Fetal hydrops can develop

Conclusion

- **Systematic approach**
- Stomach/bladder must be seen
  - If not, get patient to go for a walk/recheck
- Don't assume normality