ISUOG Basic Training

Assessing the Neck & Chest

Learning objectives

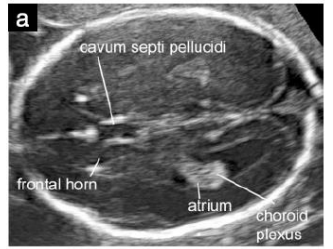
At the end of the lecture you will be able to:

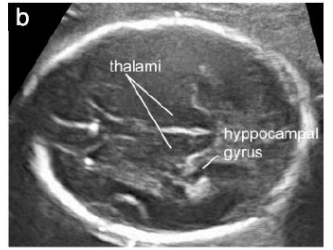
- Recognise the differences between the normal & most common abnormal ultrasound appearances of the neck (plane 6)
- Recognise the differences between the normal & most common abnormal ultrasound appearances of the chest (planes 7-10), excluding the heart

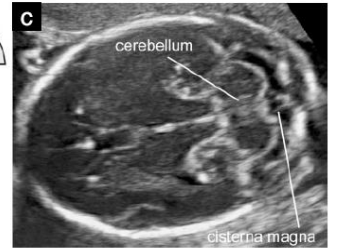
Key questions

- What are the key ultrasound features that describe the normal appearance of the fetal neck?
- What probe movements should be used to distinguish between true & a false positive suspicion of nuchal abnormality?
- What are the key ultrasound features that distinguish between normal & abnormal appearances of the fetal lungs?
- Which abnormalities should be excluded after correct assessment of the neck & chest, excluding the heart?

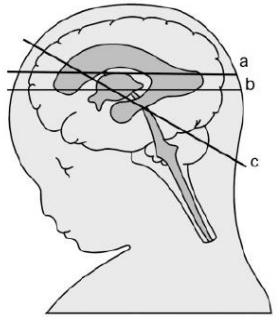
Neck & Chest

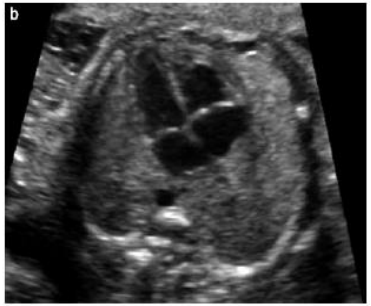


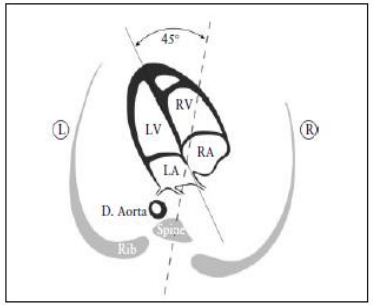


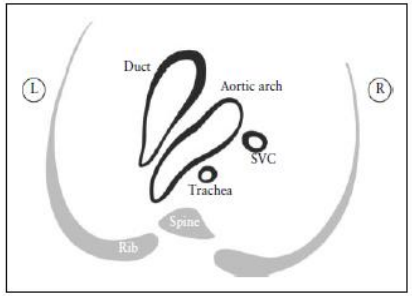


Anatomical area	Plane	Description
Head	6	**transcerebellar plane***
Thorax	7 10	**lungs,** (4 chamber view of heart) **3 vessel trachea (3VT) view of heart**









* measurement required

20 + 2 planes & abnormal appearances

Plane	Area	Abnormal appearances (50+IUD) excluded by the correct 2+20 approach
Sweep 1		Anencephaly, IUD
1-3	Spine	Abnormal abdominal situs, left sided diaphragmatic hernia, meningocoele, Open spina bifida, sacral agenesis, sacral coccygeal teratoma,
4-6	Head	Alobar holoprosencephaly, banana shaped cerebellum, cystic hygroma, large posterior fossa cyst, lemon shaped skull, occipital encephalocele, skin edema, ventriculomegaly, lymphangioma…
7-10	Thorax	AVSD, CPAM, double aortic arch, ectopia cordis, overriding aorta, persistent left vena cava*, right aortic arch, severe aortic stenosis, coarctation & pulmonary stenosis, significant pericardial effusion (>4.0mm) & pleural effusion (>4.0mm), hydrothorax, situs inversus/ambiguous, tetralogy of fallot, transposition, univentricular heart, CCAM, sequestration CDH,…
11-13	Abdomen	Ascites, bilateral renal agenesis, duodenal atresia, echogenic bowel*, gastroschisis, omphalocoele, renal pelvic dilatation (>7.0mm AP), small/absent stomach
14	Pelvis	Cystic renal dysplasia, lower urinary tract obstruction, 2 vessel cord
15-17	Limbs	Fixed flexion deformities wrist, severe skeletal dysplasia (some), talipes
18-20	Face	Anopthalmia, cataract*, cleft lip, proboscis*, severe micrognathia

AVSD – atrioventricular septal defect CPAM – congenital pulmonary airway malformation
IUD - intrauterine death * optional, for local decision as to whether or not included

Moving through the 20 planes

Plane	Description
1	Sagittal complete spine with skin covering
2	Coronal complete spine
3	Coronal section of body
4	Transventricular plane*
5	Transthalamic plane*
6	**Transcerebellar plane***
7	Lungs, 4 chamber view of heart
8	Left ventricular outflow tract (LVOT)
9	Right ventricular outflow tract (RVOT) & crossover of LVOT
10	3 vessel trachea (3VT) view of heart

* measurement required

Plane 6

- Focale zone at appropriate level
- Image at appropriate depth
- Angled axial plane of the head
- Symmetric appearance of cerebellar
- Midline falx imaged
- Thalami imaged
- CSP imaged
- Cerebellar vermis and 4th ventricle imaged
- Cisterna magna imaged

Moving through the 20 planes

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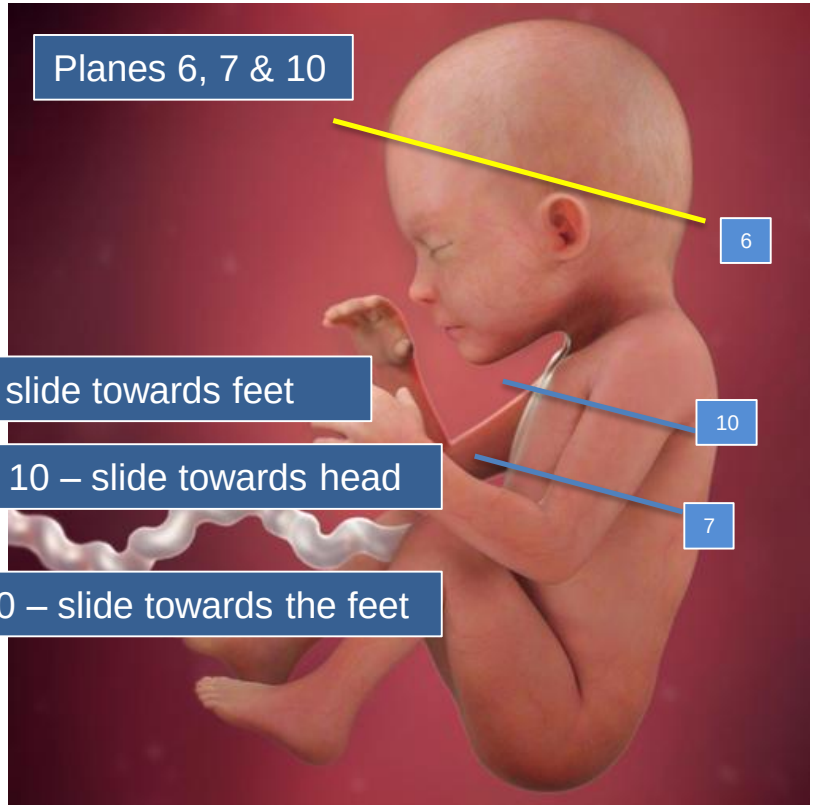
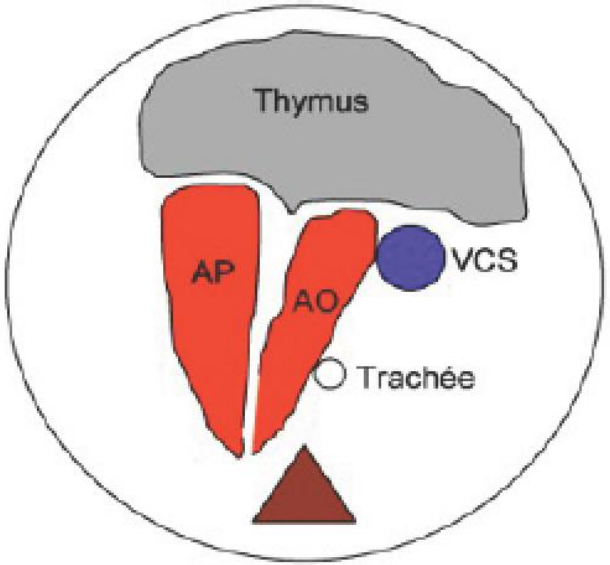
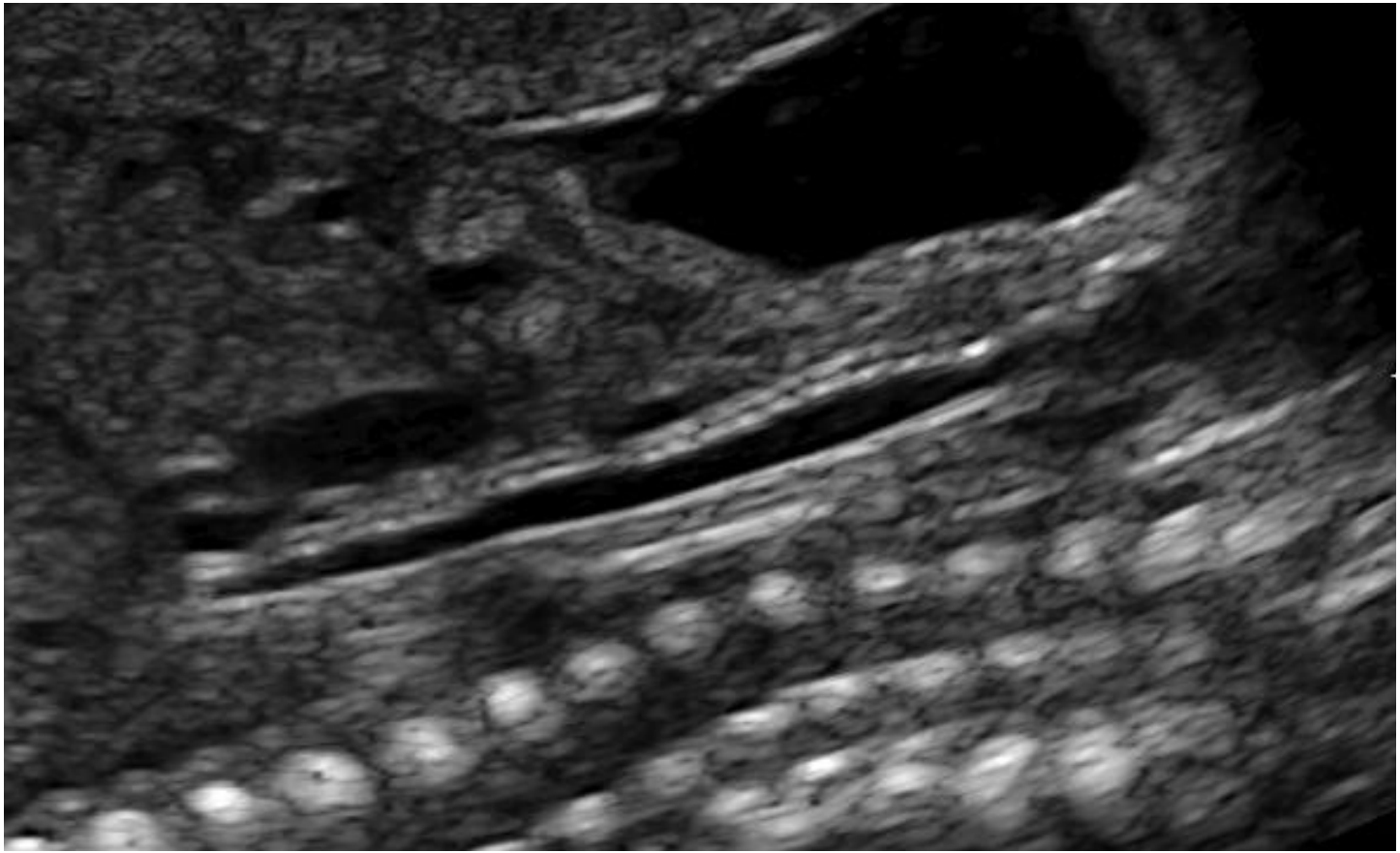
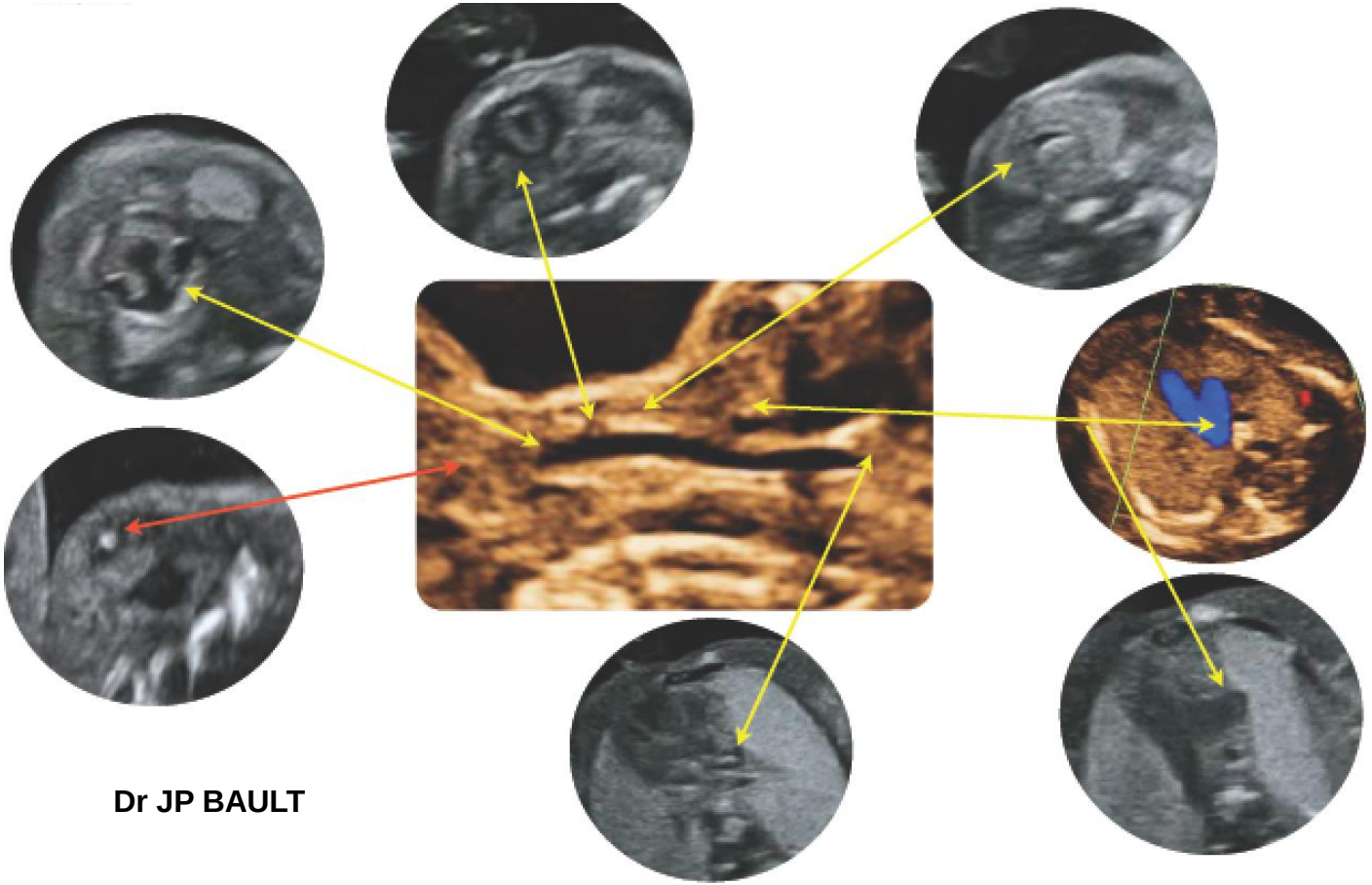


What are the key ultrasound features that describe the normal appearance of the fetal neck?







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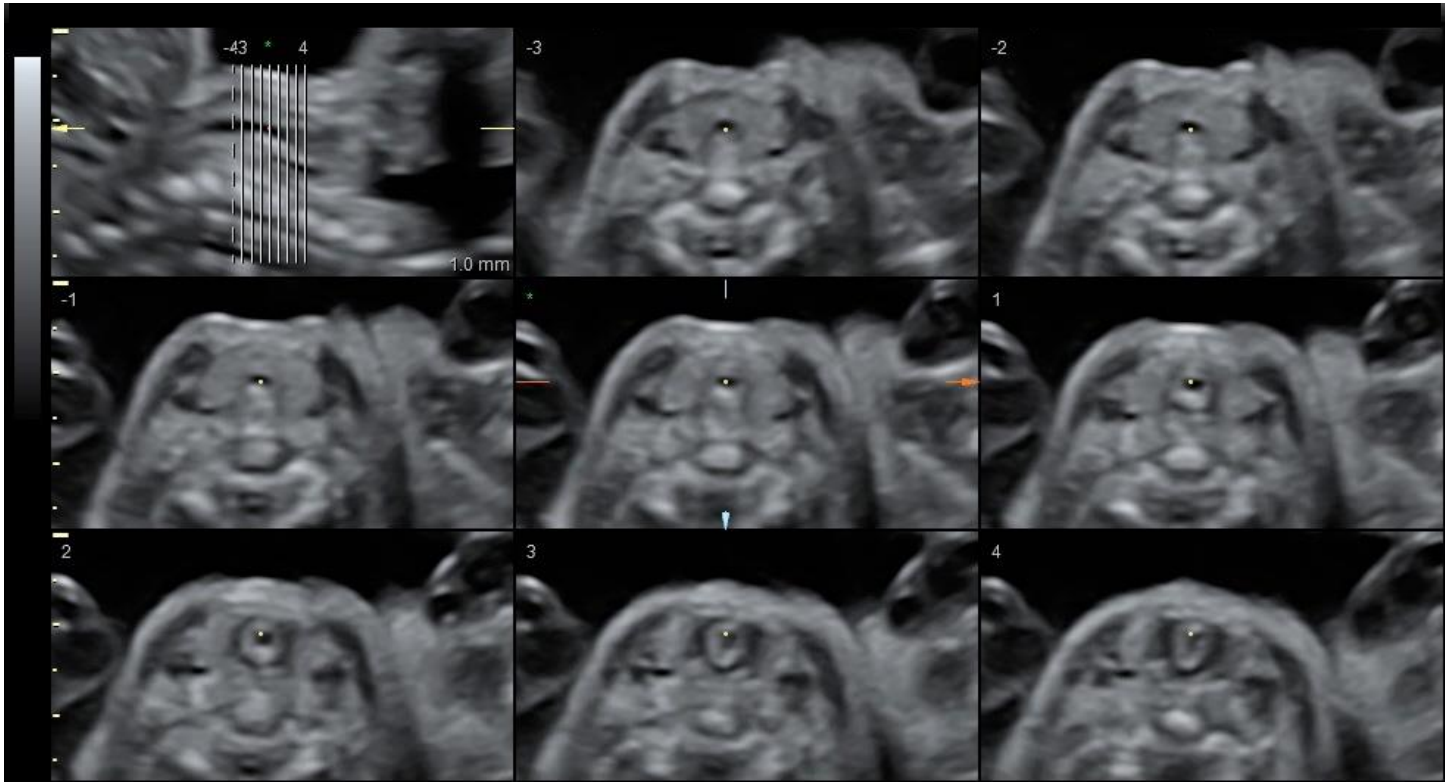
-43
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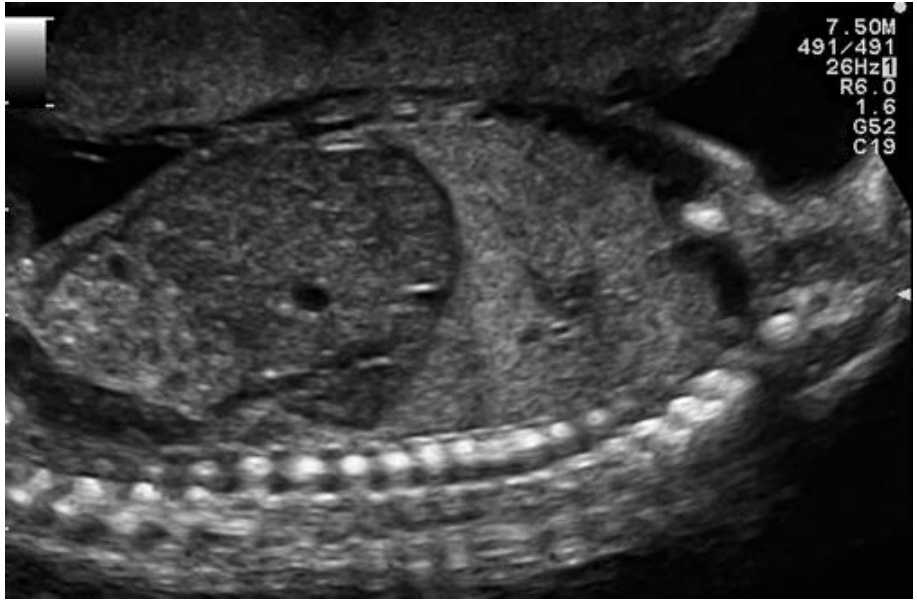
What are the key ultrasound features that describe the normal appearance of the fetal chest?

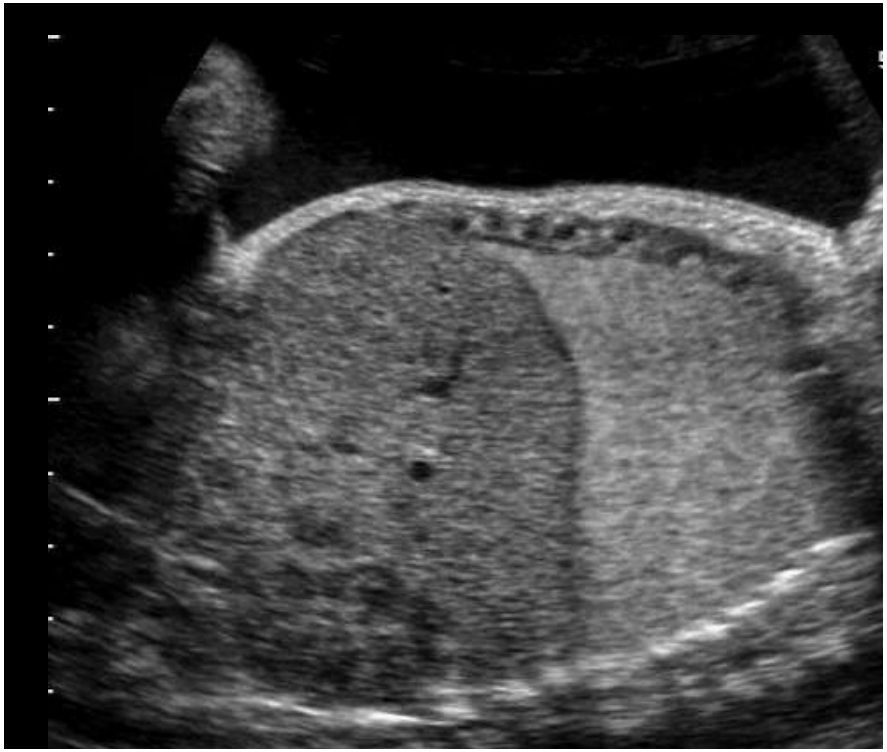
- Contents:
  - Lung
  - Mediastinum :
    - Heart
    - Thymus
    - Internal structures : trachea, esophagus
    - Arteries & veins : aorta, SCV, IVC, PA
  - Bones
  - Xiphoid process and diaphragm

Plane 7

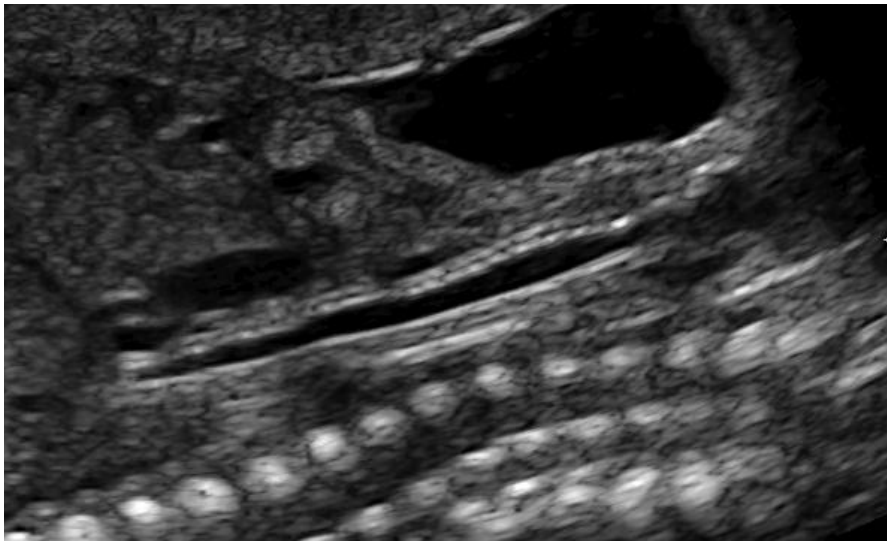
Probe movements

Parasagittal plane



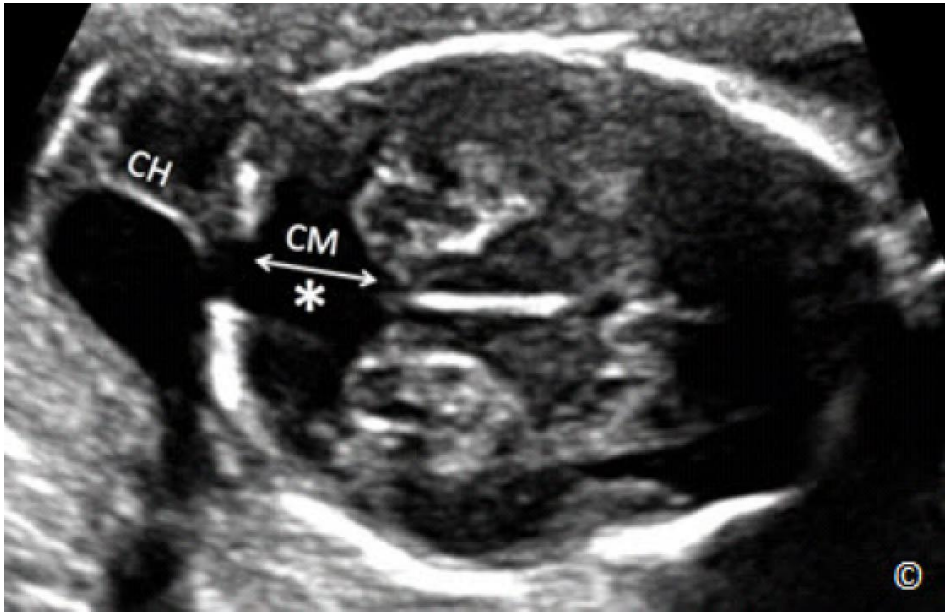


What probe movements should be used to distinguish between true & a false positive suspicion of nuchal abnormality?



Which abnormalities should be excluded after correct assessment of the neck?

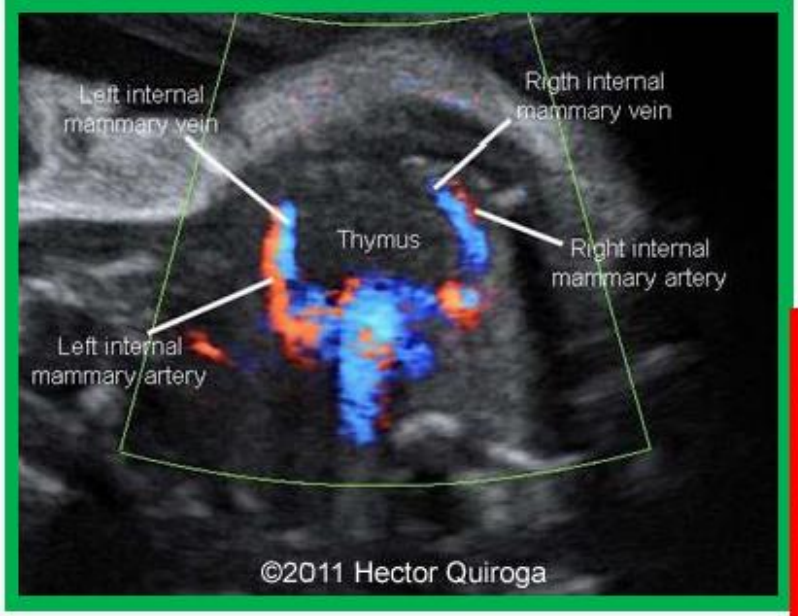
- Nuchal edema
- Encephalocele
- Lymphangioma
- Thyroid problems
- Hypoplastic Thymus



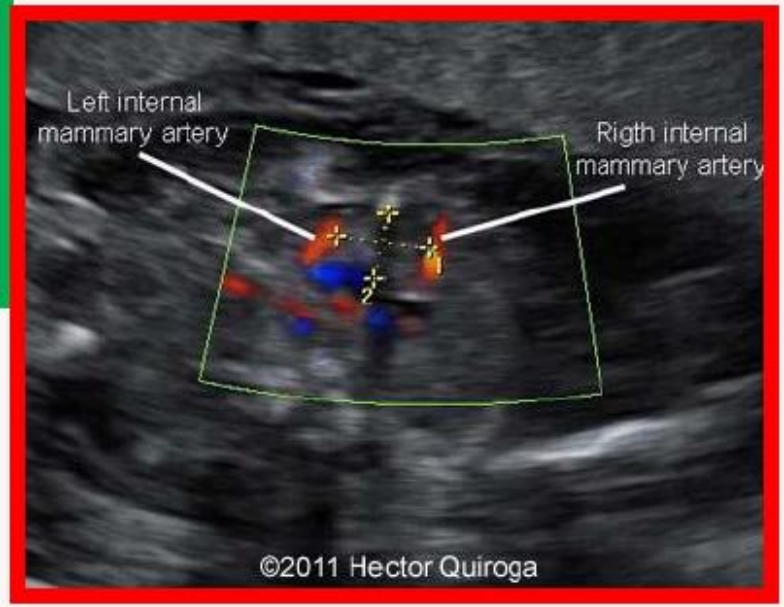
Thymic hypoplasia- aplasia

Dr JM Levaillant

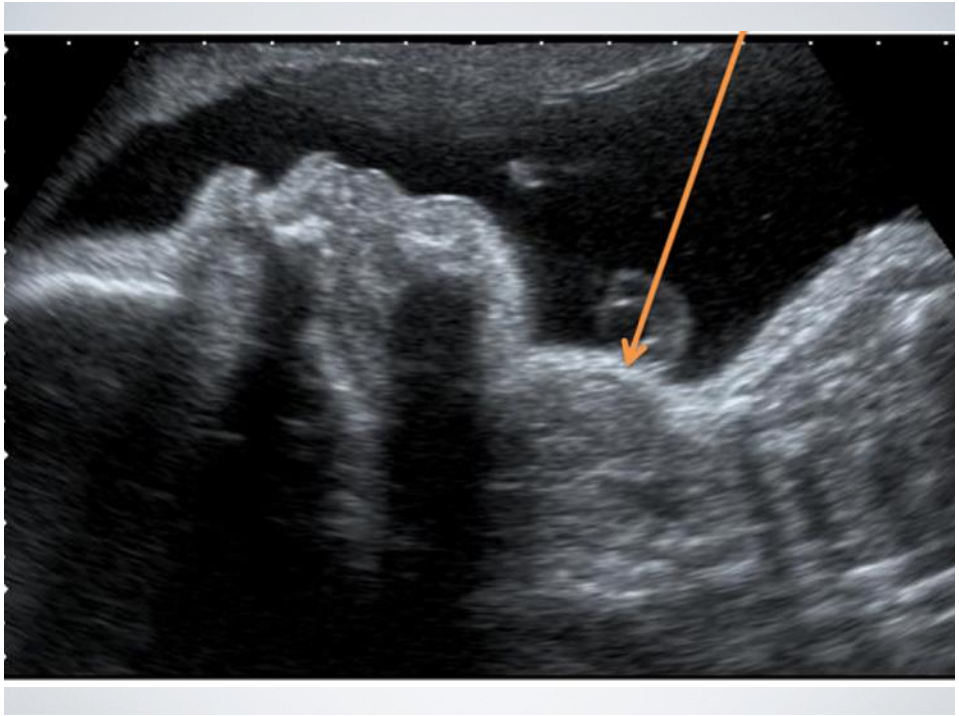
Normal thymus

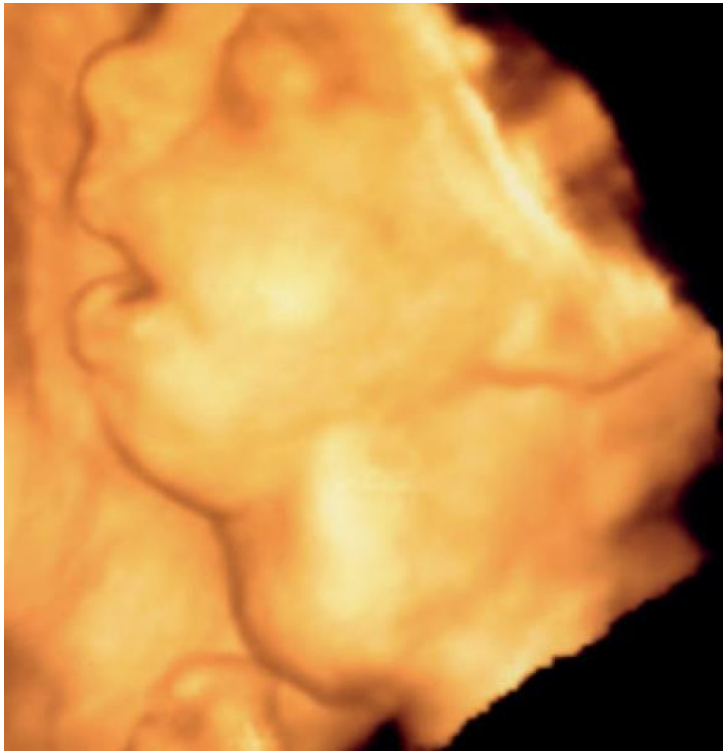


Hypoplasic thymus



Thyroid





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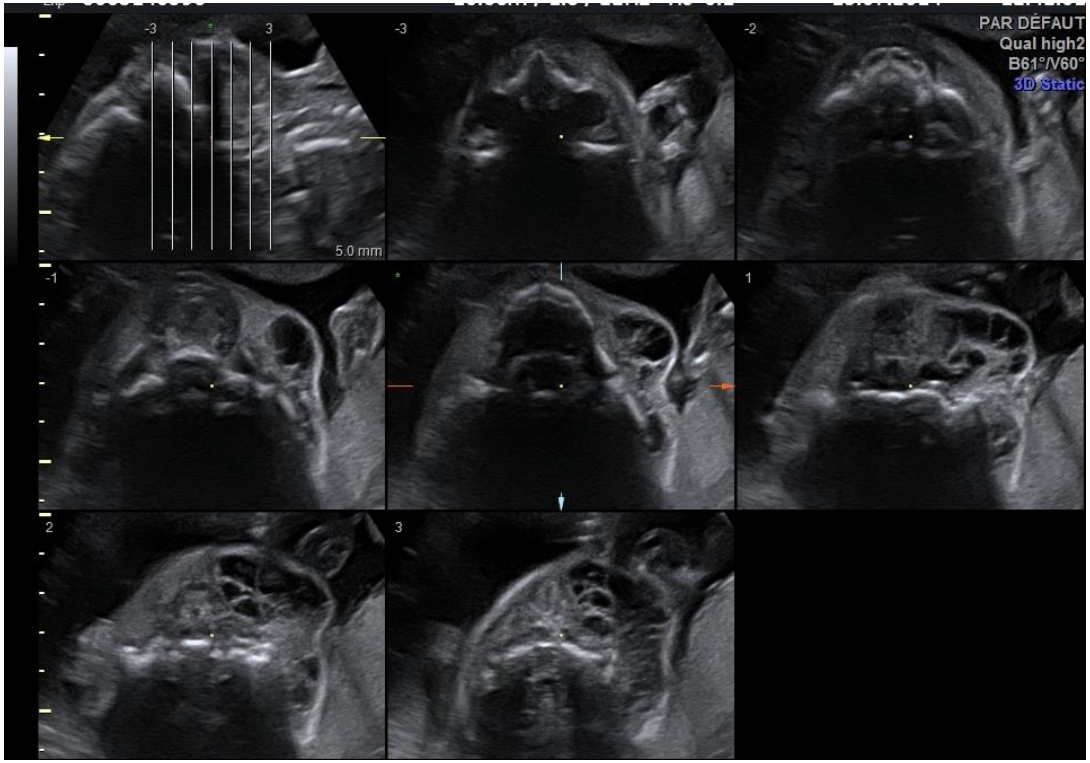
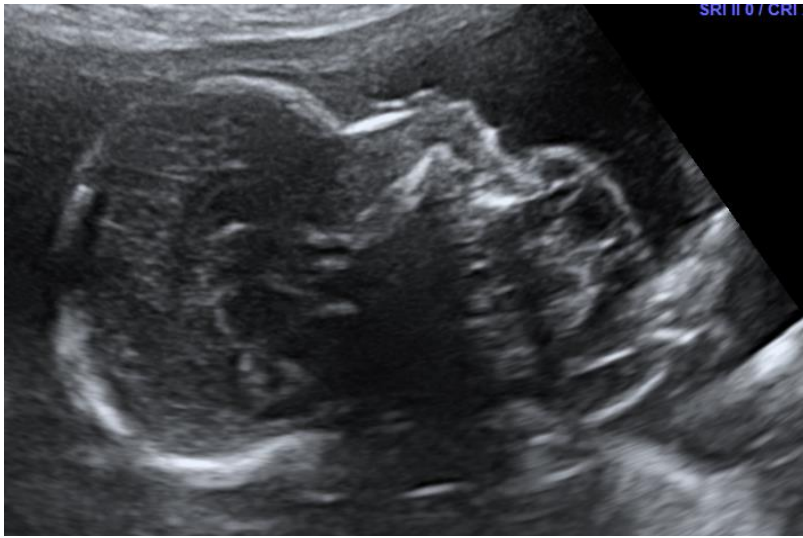
Lymphangioma





What are the key ultrasound features that distinguish between normal & abnormal appearances of the fetal lungs?

- Types of anomalies:
  - Abnormal hyperechogenicity of pulmonary tissue (CCAM, sequestration,…)
  - Anechogenous:
    - Free-fluid:
      - Pleural effusion
      - Hydrothorax
    - Cystic lesions:
      - Pulmonary origin (CCAM, bronchogenic cyst,…)
      - Extra-thoracic origin (CDH)
  - Association of cystic and echogenicity anomalies (CDH, CCAM)

What are the key ultrasound features that distinguish between normal & abnormal appearances of the fetal lungs?

- Types of anomalies:
  - Abnormal echogenicity of pulmonary tissue:
    - Hyperechogenicity:
      - Diffuse
      - Localized
    - Anechogenous images:
      - Cysts
      - Presence of extra-thoracic structures (stomach…)
  - Pleural effusion

Which abnormalities should be excluded after correct assessment of the chest, excluding the heart?

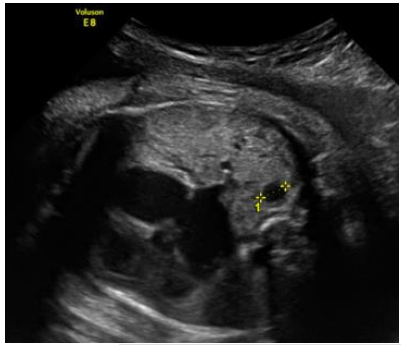
- Lung Malformations:
  - Congenital Cystic Adenomatoid Malformation (CCAM)
  - Broncho-pulmonary Sequestration (BPS) (& Arteriovenous malformation)
  - Bronchogenic Cyst, Bronchiol stenosis, Congenital lobar emphysema…
- Unilateral Pulmonary Hypoplasia or Aplasia
- Congenital diaphragmatic hernia
- Hydrothorax (pleural effusion)

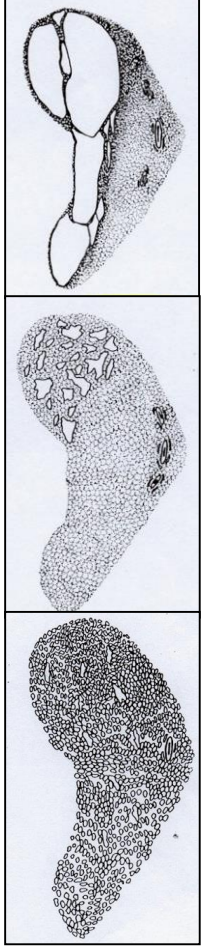
Abnormal echogenicity of pulmonary tissue :CCAM

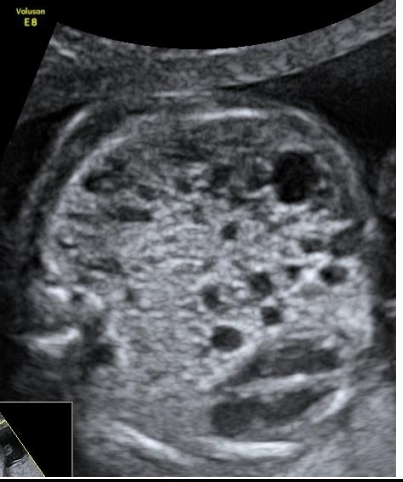
- Most commonly diagnosed lung Malformation in prenatal
- Abnormal branching of immature bronchioles
- Both cystic and solid areas
  - Type I : Single or multiple cyst (3-10 cm diam.) surrounded by smaller cysts and a compresse normal parenchyma
  - Type II: Various smaller cyst (0,5-2cm)lined cuboidalor culmunar epithelial cells
  - Type III: Small cystic lesions rarely larger then 0,2 cm.

Abnormal echogenicity of pulmonary tissue (diffuse and localized):CCAM

- Transcription in Ultrasound Finding:
  - Type I : Single or multiple large anechoic cysts with usually mediastinal shift
  - Type II: Variable appearances depending on the composition of the malformation
  - Type III: homogeneously solid masses with normal adjencent parenchyma






Voluson
E8


Voluson
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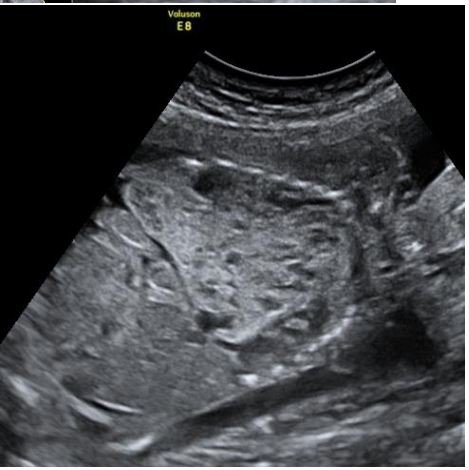
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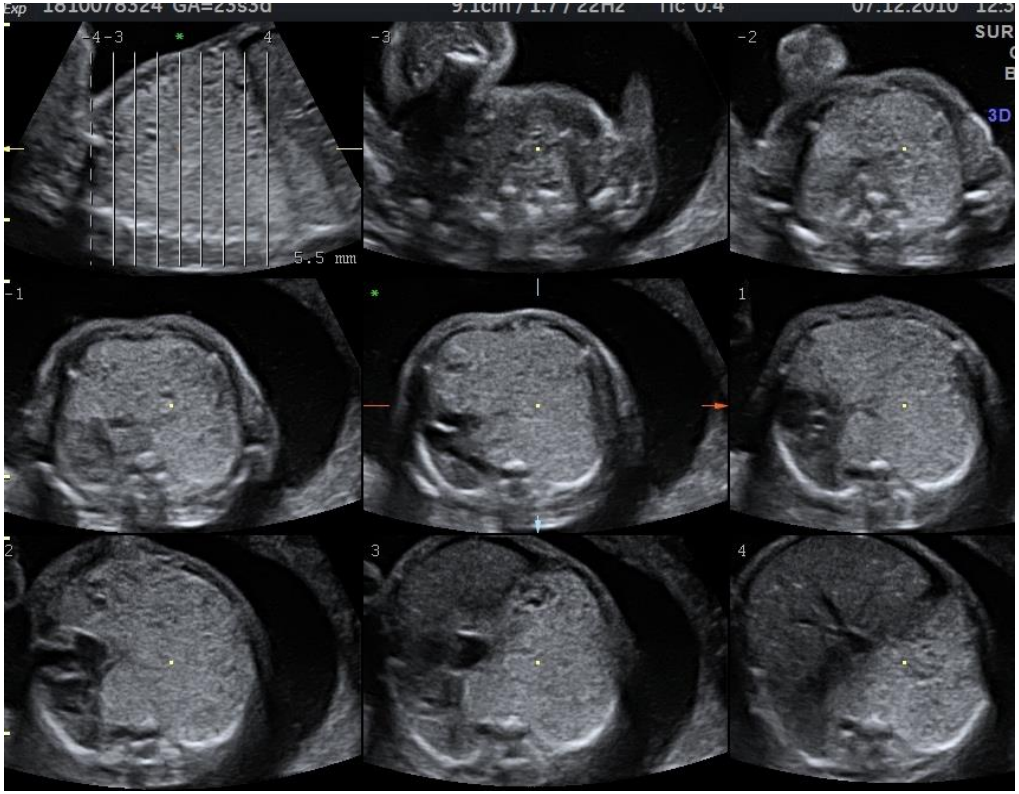
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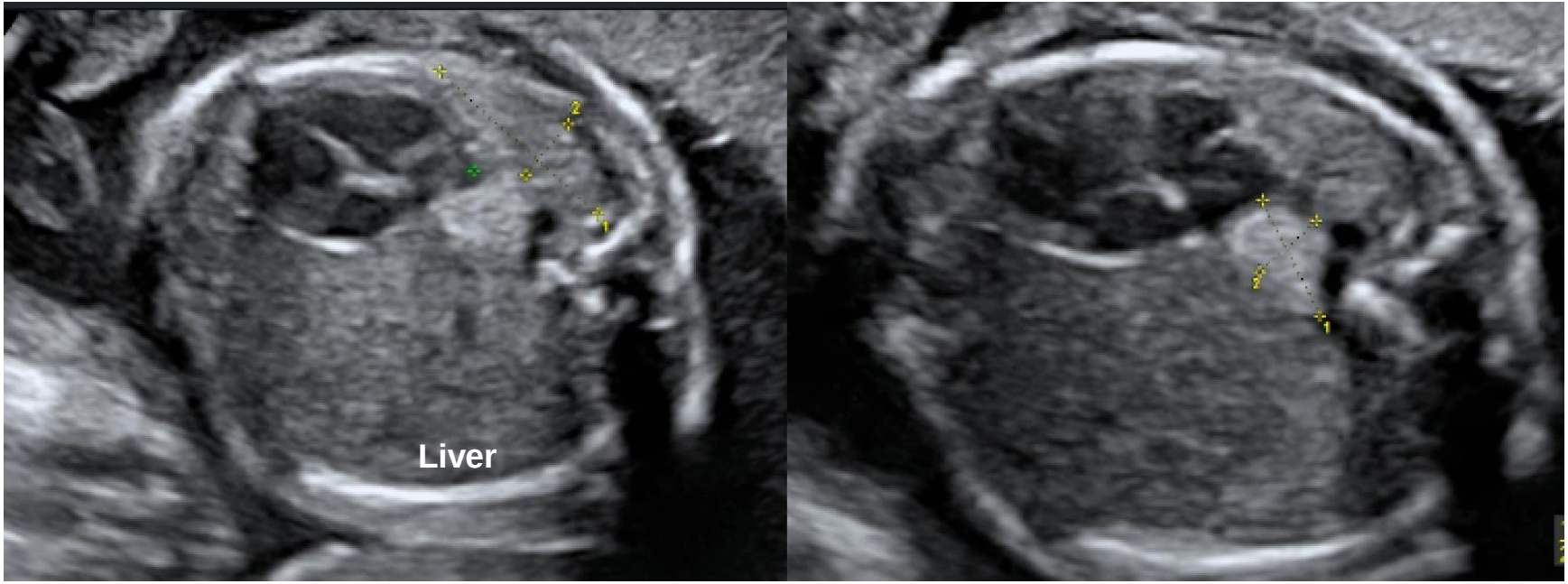
Abnormal echogenicity of pulmonary tissue (diffuse and localized): Right CDH



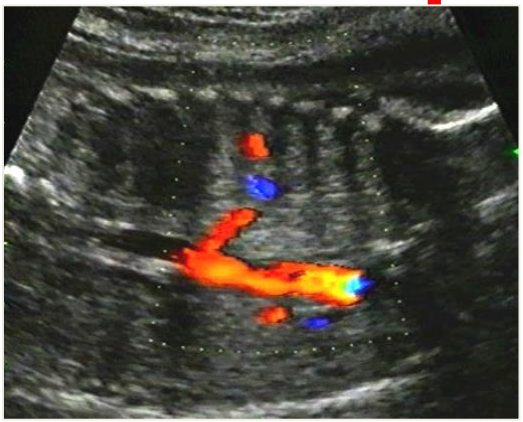
Abnormal echogenicity of pulmonary tissue
Bronchopulmonary sequestration

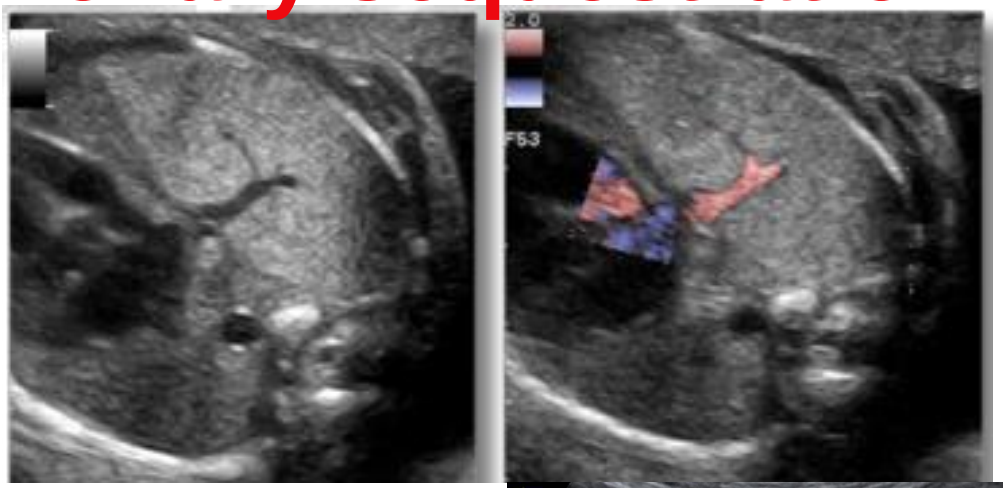
- Embryonic mass composed of non-functioning primitive lung tissue that does not communicate with the tracheobronchial tree and has anomalous systemic blood supply (supply by a systemic artery and drained by a pulmonary or a systemic vein)

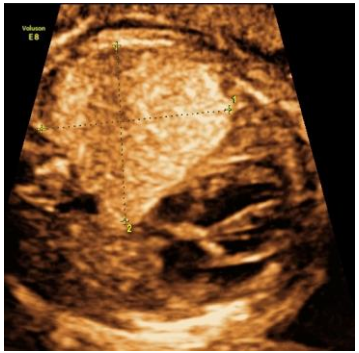
- Extralobar (25%) or intralobar(75%)

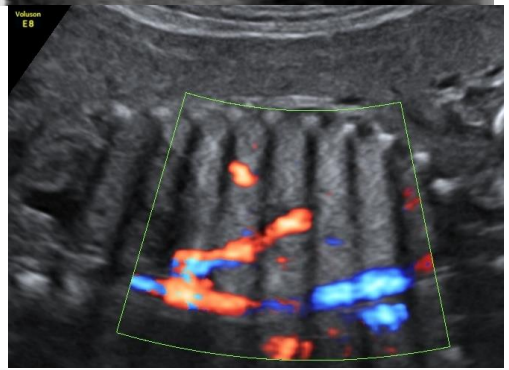
- Usually on the base of lungs

Bronchopulmonary sequestration

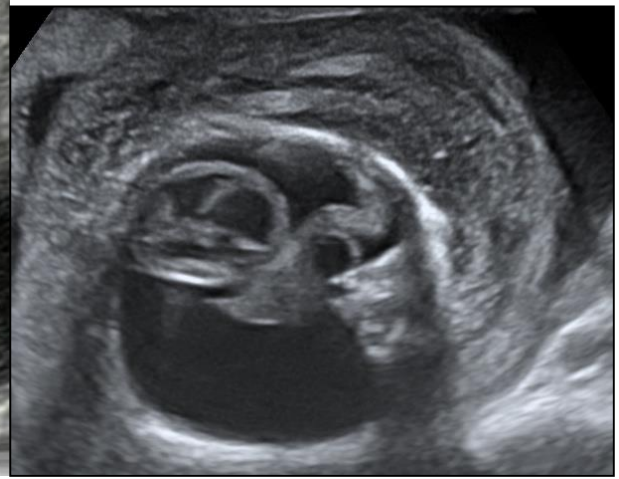








Pleural effusion: minimal to hydrothorax



Association of cystic and echogenicity anomalies
CDH: left CDH

Echogenicity anomalies: CDH

Key points

1. Sliding between planes 6,7 and 10 allows identification of the most common pathologies of the neck and the chest
2. Always double check the structures with a sagittal and parasagittal sweep
3. Verify echogenicity and homogeneity of the lungs
4. Your role is to distinguish between the range of normal & abnormal appearances
5. Any appearance which you cannot confirm as normal should be referred for a more experienced opinion