ISUOG Basic Training

Examining Fetal Anatomy from Longitudinal Sections

Learning objectives

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

- Describe how to obtain the 3 planes required to assess the fetal anatomy in longitudinal section

- Recognise the differences between the normal & most common abnormal ultrasound appearances of the 3 planes

Key questions

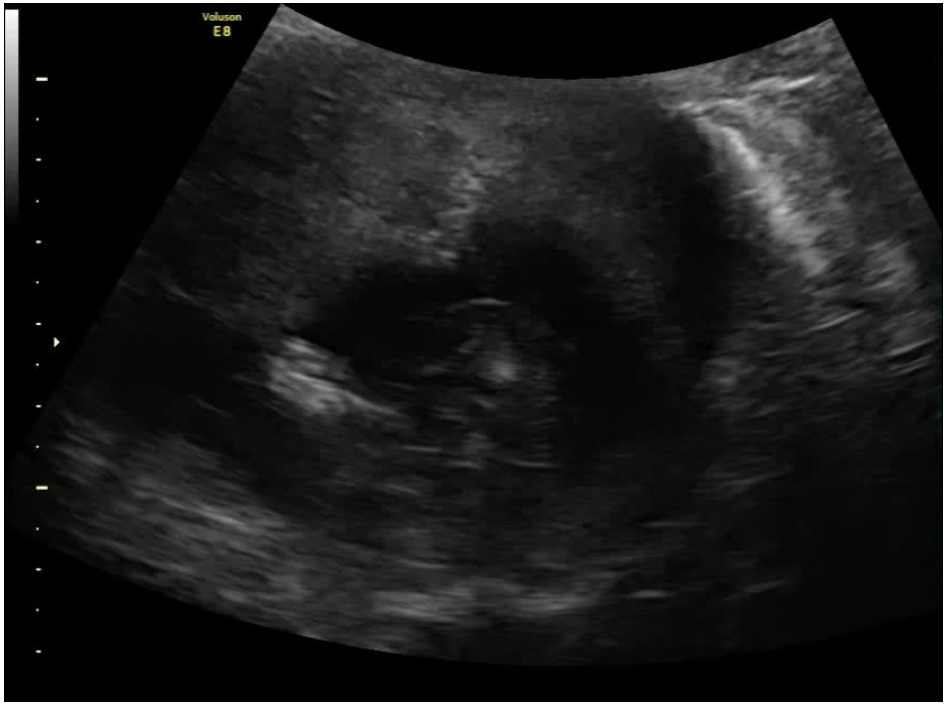
- What is the purpose of starting the scan with overview 1?
- What are the key ultrasound features of plane 1?
- What probe movements are required to move from plane 1 to plane 2?
- Which abnormalities should be excluded after correct assessment of planes 1, 2 & 3?

Fetal lie and anatomy

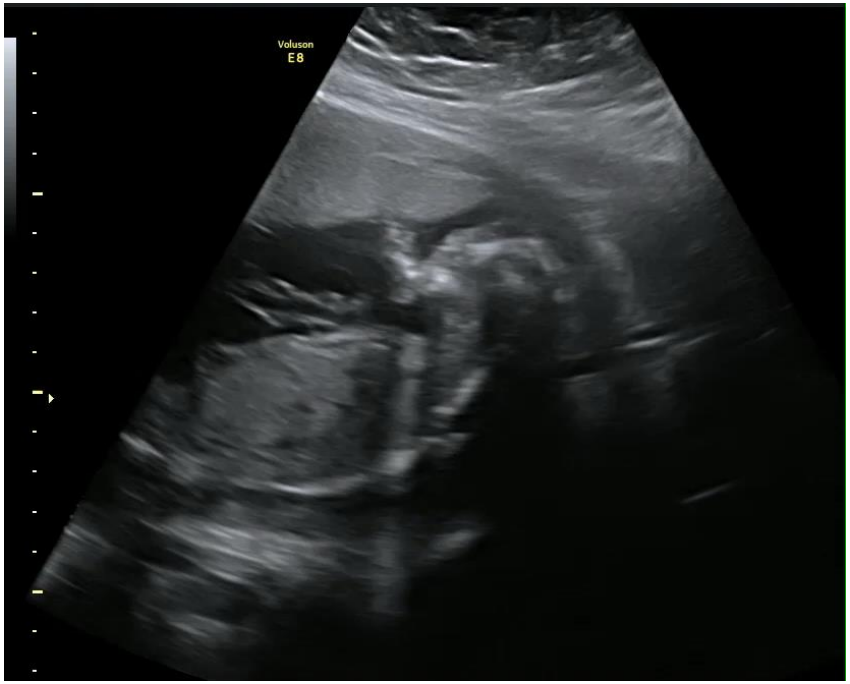
- Longitudinal scan – sagittal and coronal planes
  - Fetal heartbeat
  - Fetal head
  - Spine
  - Thoraco-intestinal anatomy and situs

Longitudinal scan

Fetal heartbeat



Fetal head



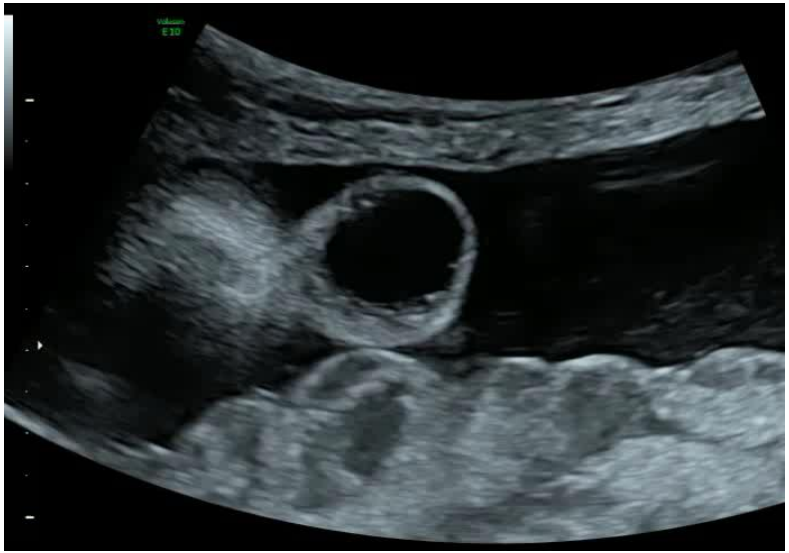
Anencephaly

Always confirm any anomaly in a different plane

Encephalocele

Sagittal plane

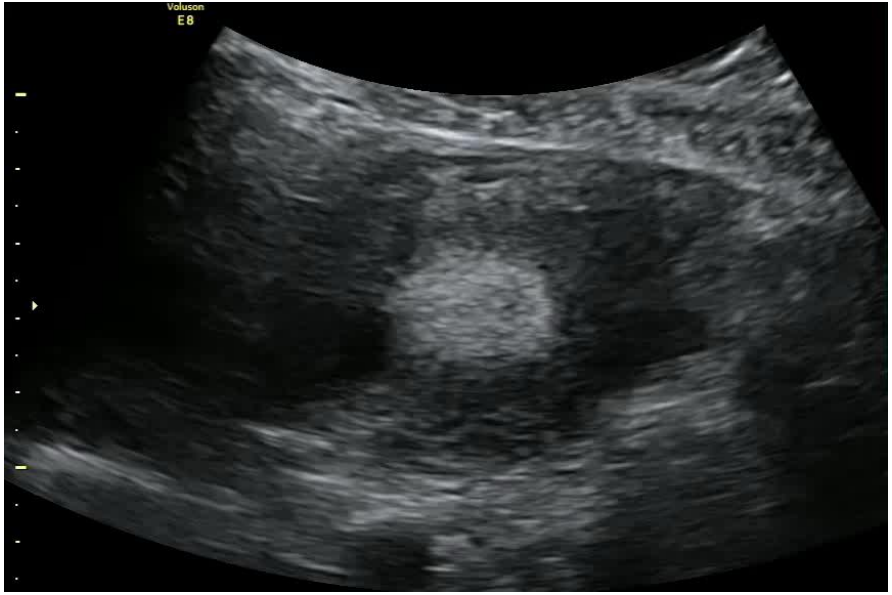
Coronal plane



Encephalocele

Coronal plane

Transverse plane

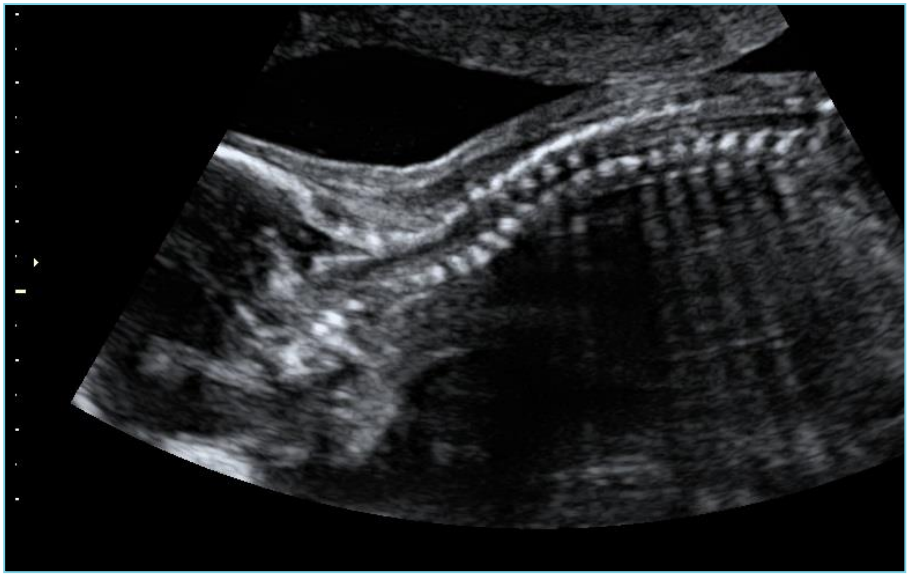


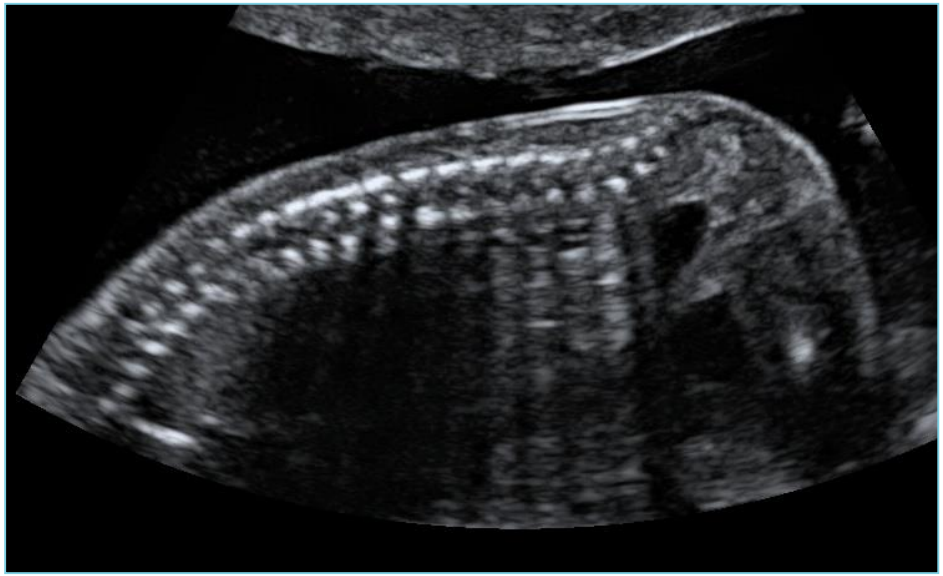
Prevalence neural tube defects

- All NTD 9.1:10 000
  - Anencephaly 3.3:10 000
  - Spina bifida 4.6:10 000
  - Encephalocele 1.2:10 000
- Features spina bifida
  - U-shaped open vertebra
  - Meningocele - cyst
  - Myelomeningocele – cyst with neural tissue

Koshood et al. BMJ 2015;351:5949

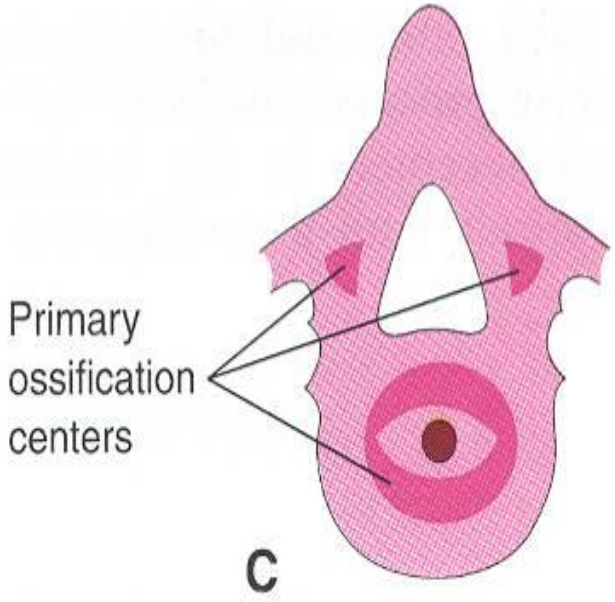
Sagittal spine – plane 1



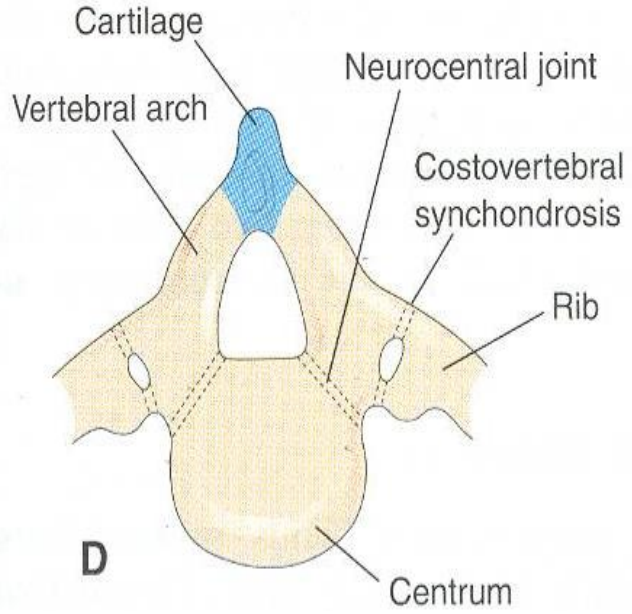


Embryology spine

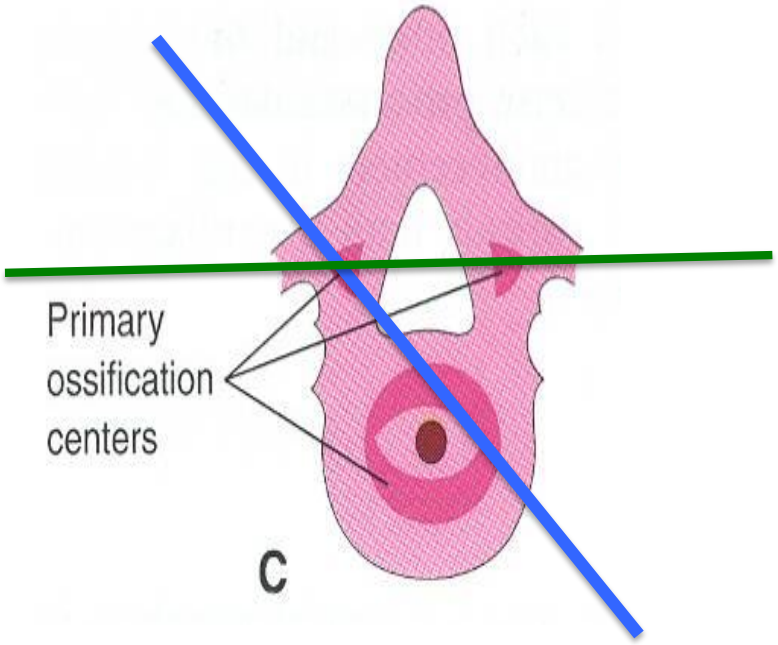
7 weeks’



40 weeks’



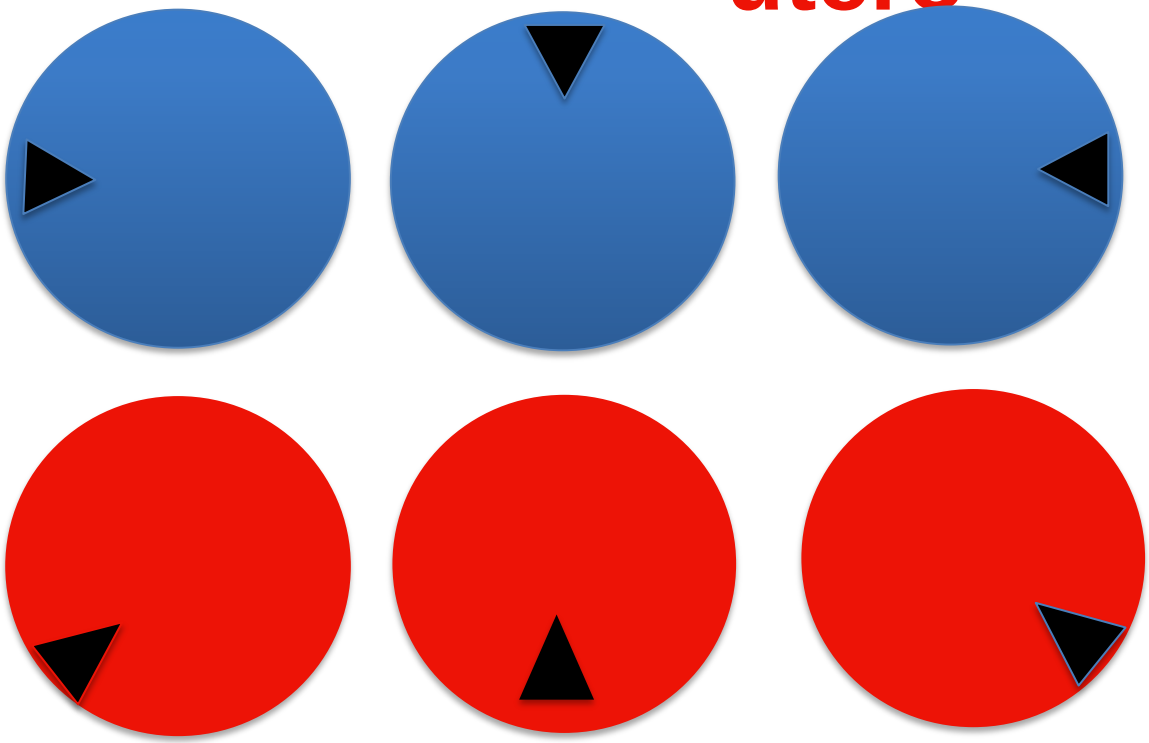
Ossification centers of the spine



Sagittal plane

Coronal plane

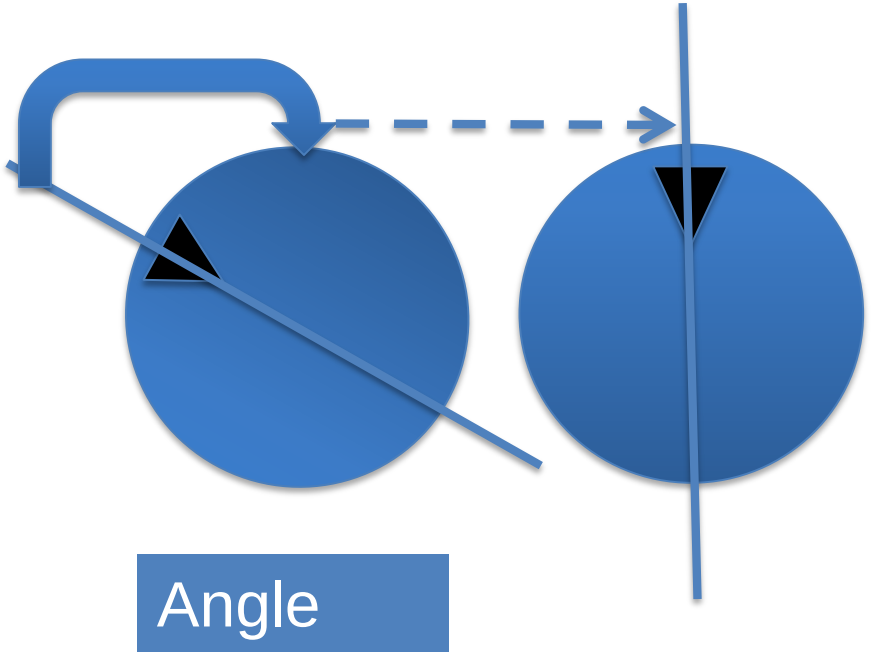
Sagittal plane and position of spine in utero



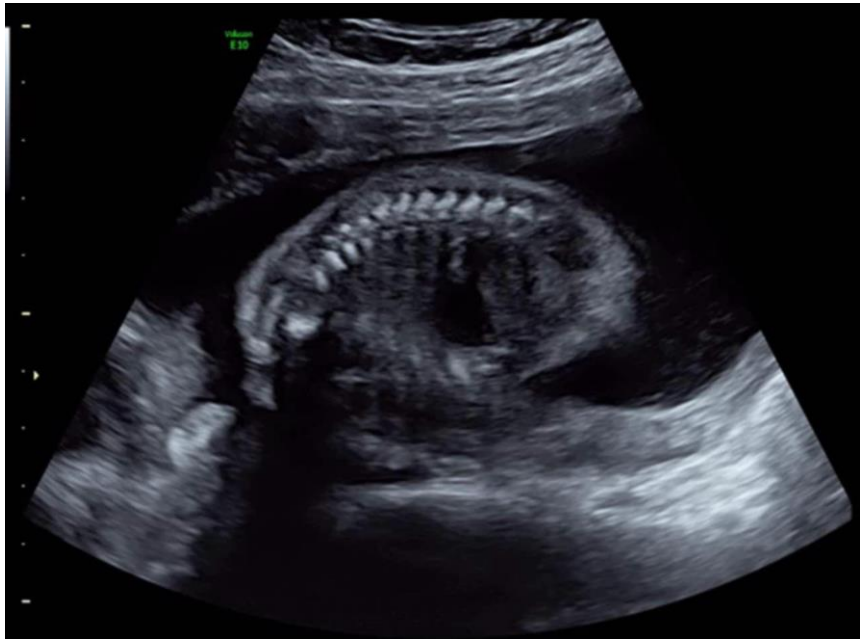
Possible to obtain sagittal plane spine

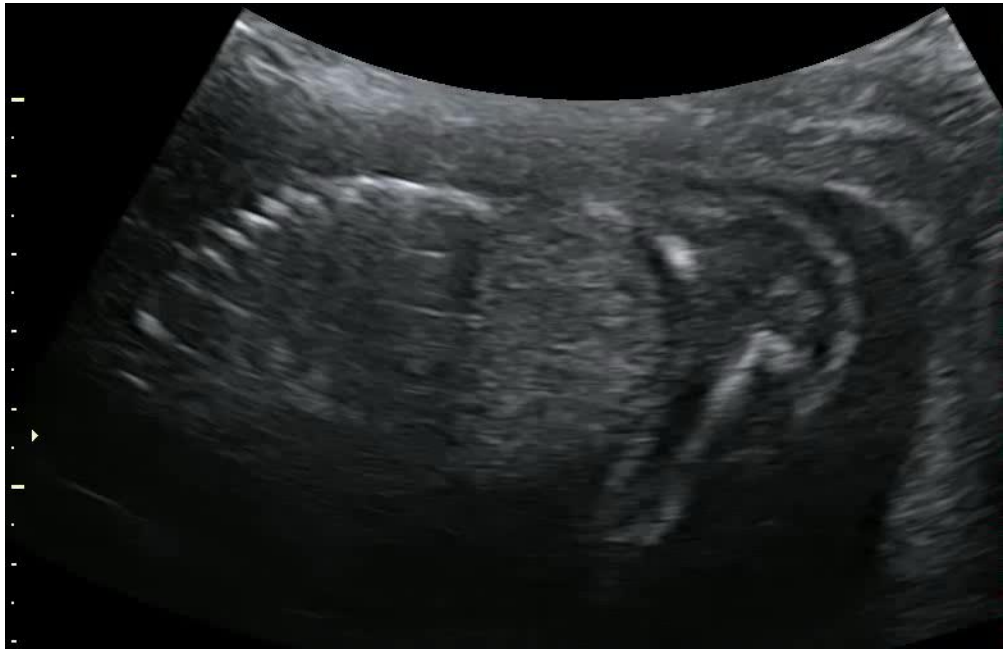
Impossible to obtain sagittal plane spine

Find the sagittal plane example

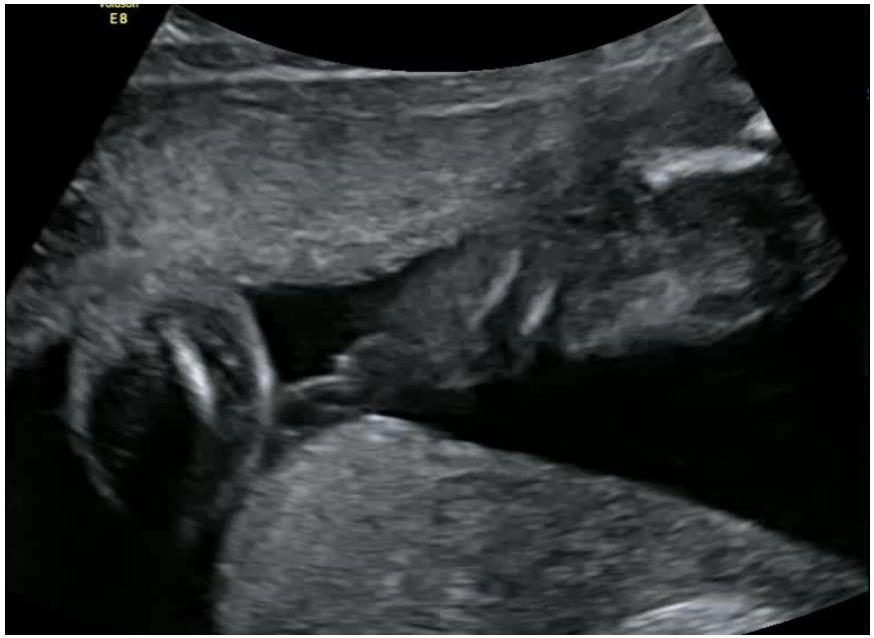


Sagittal plane spine – plane 1





Incorrect sagittal planes of the spine

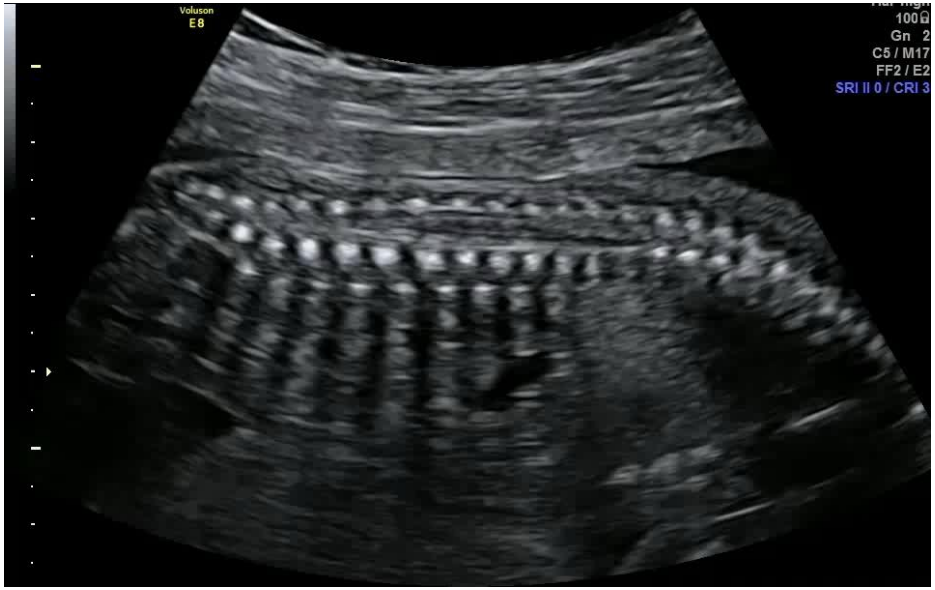


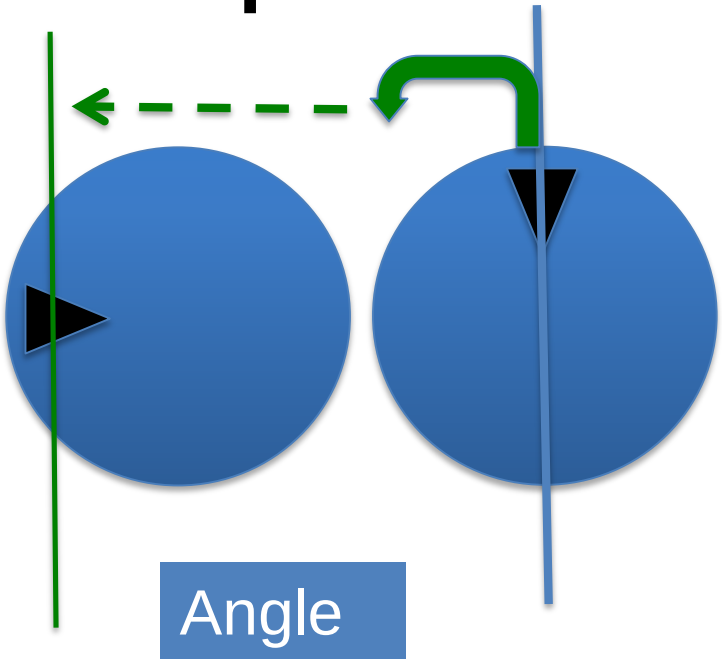
Features sagittal spine - plane 1

- Normal curve of the spine
- 2 parallel lines of small hyperechoic dots, gradually tapering at base of the sacrum (vertebral body and lamina)
- Upsweep of the sacrum
- Integrity of the skin overlying the spine
- Small distance beween spine and fetal skin consistent along the length of the spine
- Amniotic fluid between the fetal skin and the wall of the uterus

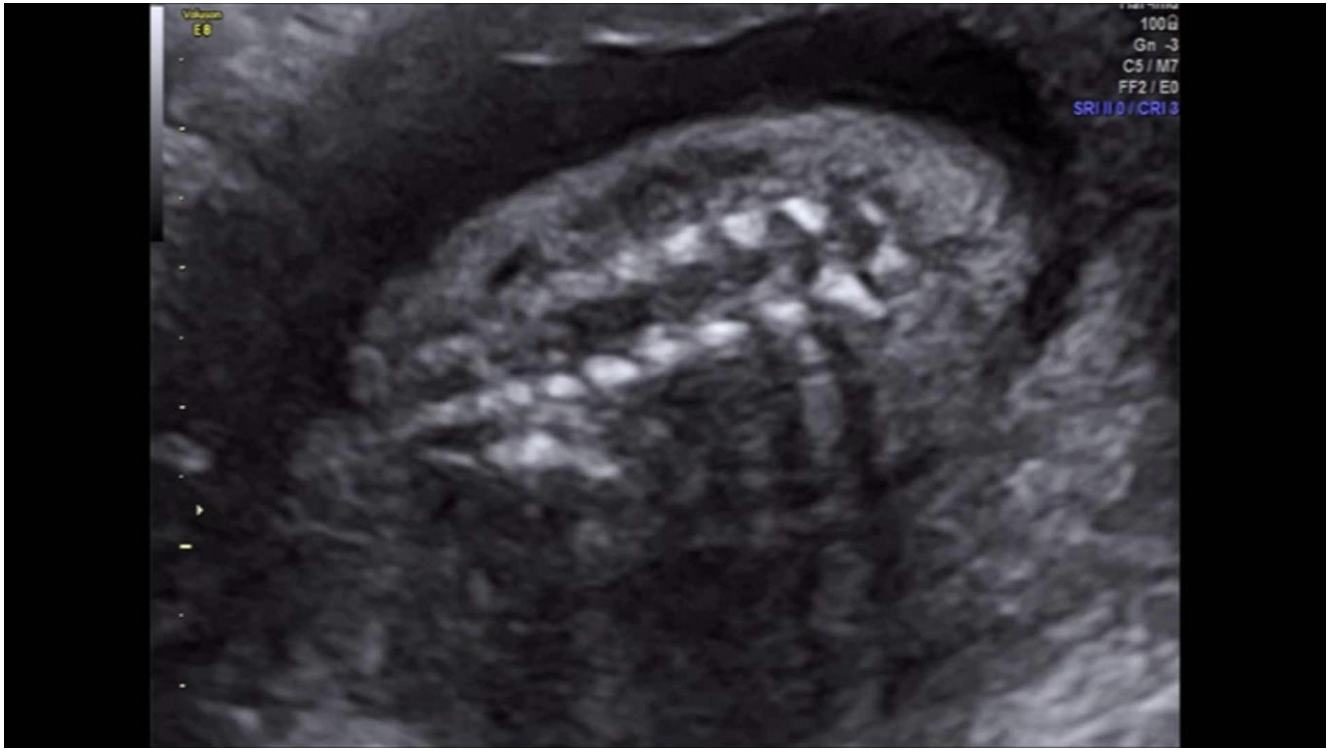
Chudleigh and Smith. Obstetrical and Gynaecological Ultrasound How, Why and When. 4th edition 2017

From sagittal to coronal plane

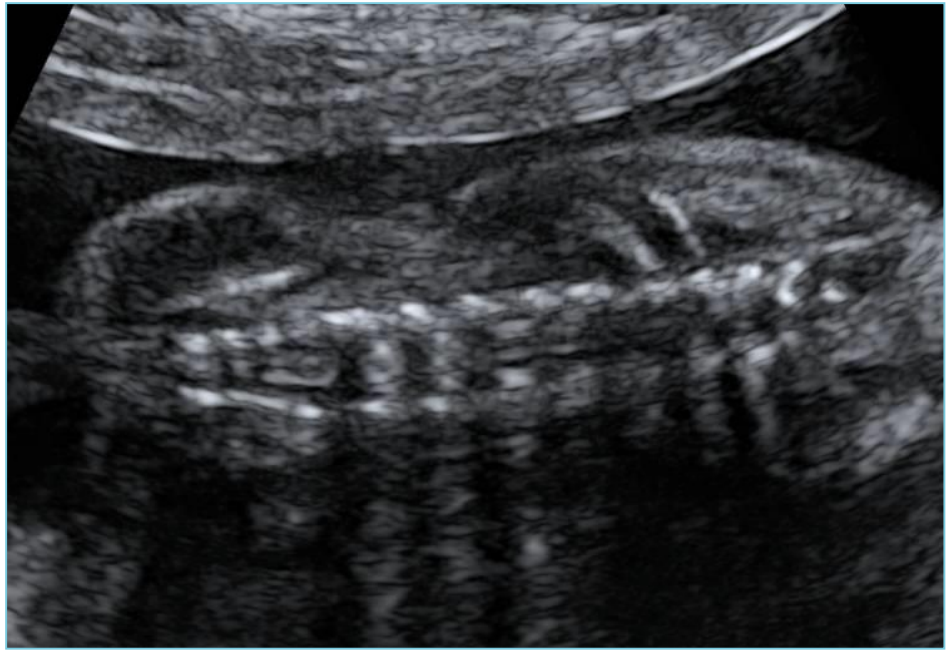


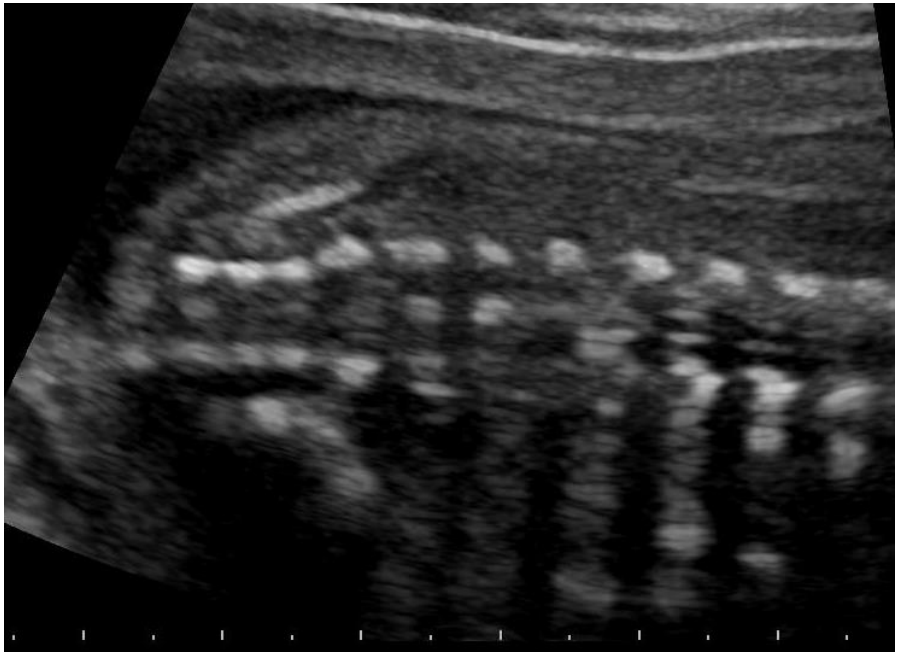


Coronal plane spine – plane 2



Coronal spine - sacral segments



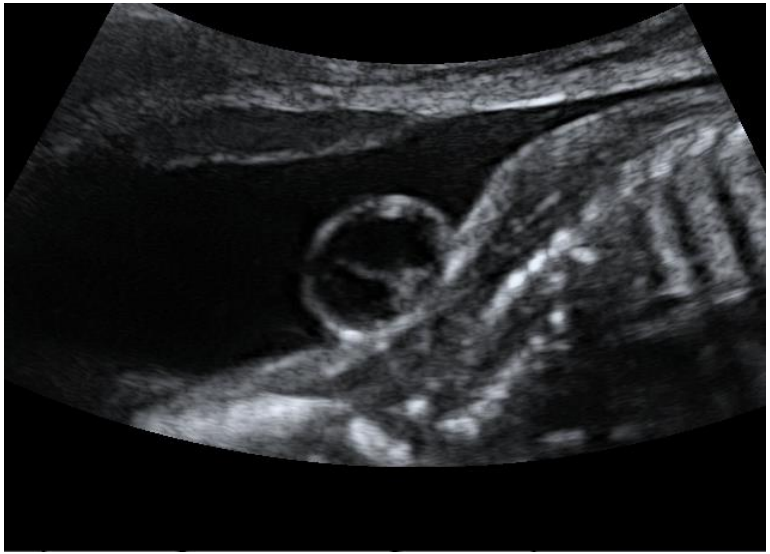


Features coronal spine – plane 2

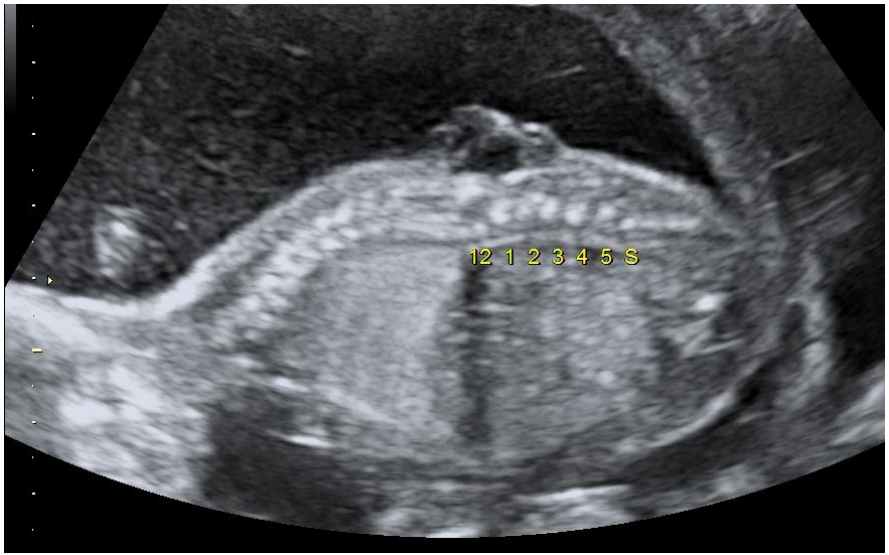
- Three echo's from the ossification center of the vertebral body, centrally, and both lamina, laterally
- Equal distance between lateral ossification centers
- *Splaying of the ossification centers indicates spina bifida*
- 4 – 5 sacral vertebra visible between both iliac crests from the proximal rim of the os iliaca

Spina bifida in sagittal plane spine

Cervical



Thoracic



Spina bifida prevalence

Cervical spine	1%
Thoracic spine	9%
Lumbar spine	73%
Sacral spine	17%

Spina bifida coronal plane

Prevalence neural tube defects

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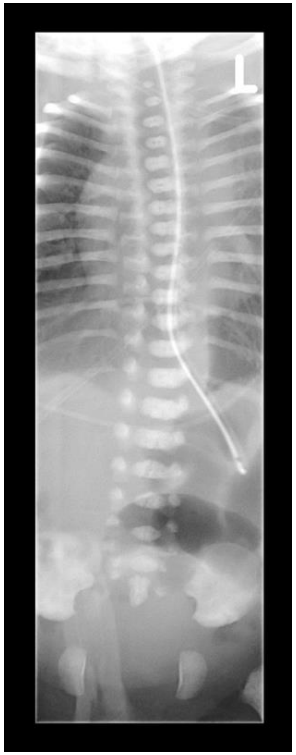
Sacral agenesis – sagittal plane 1

Sagittal

Transverse

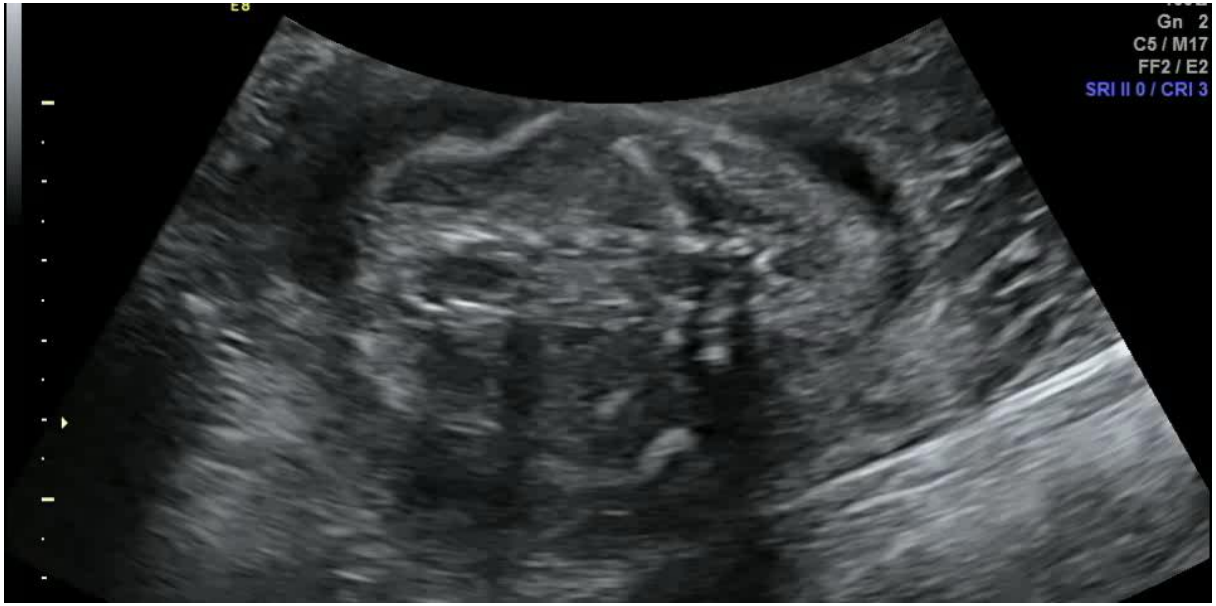


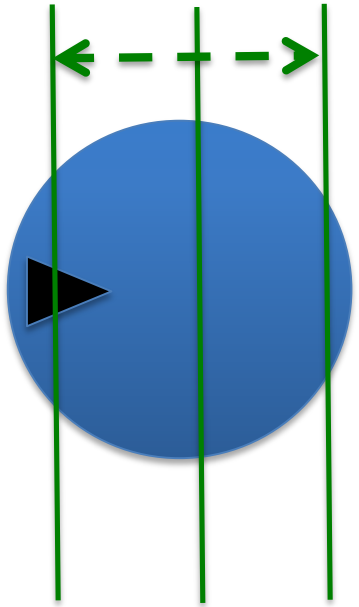
Sacrococcygeal teratoma – plane 1

Sacrococcygeal teratoma – features

- Prevalence 1:40.000
- Location midline
- Uniformly attached to coccyx
- Tumors may be cystic solid or mixed
- Location
  - Predominantly external with minor intrapelvic component
  - Predominantly external with substantial intrapelvic component
  - Predominantly internal

Coronal plane - body



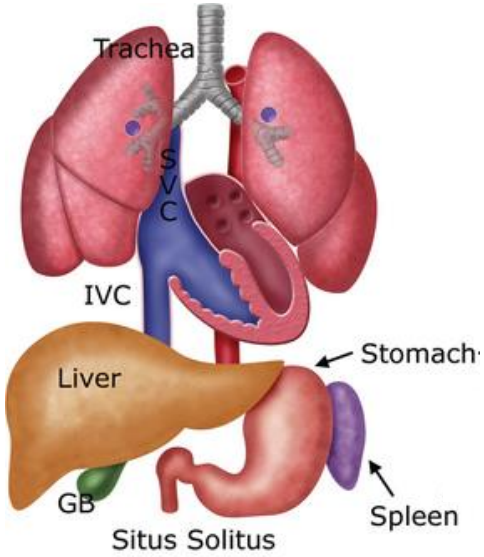


Slide

Features coronal plane - body

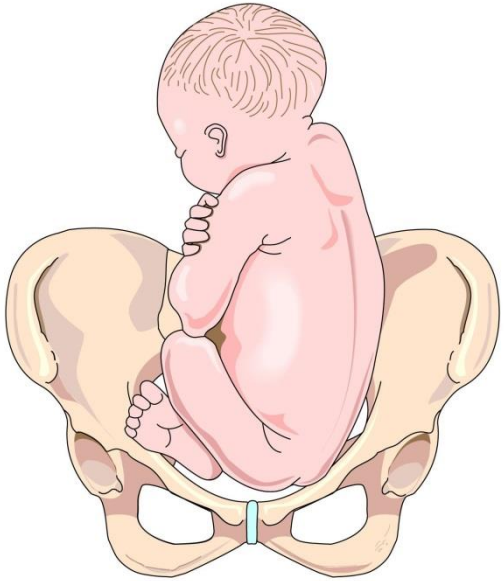
- Both lungs similar echogenicity
- Fetal heartbeat
- Continuous diaphragm from left to right between thorax and abdomen
- Stomach intra-abdominal on left side of fetal body
- Two kidneys nearly adjacent to the fetal spine
- Abdominal aorta and inferior vena cava
- Intestines with mixed echogenicity – not bright as bone
- Bladder

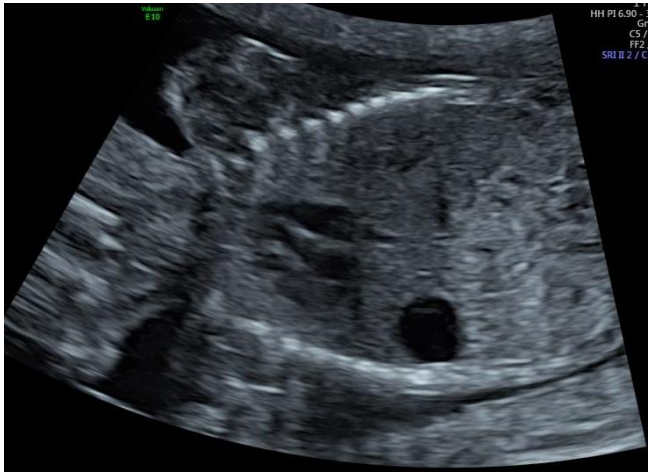
Fetal lie and presentation



Radiologykey.com

Fetal lie and presentation





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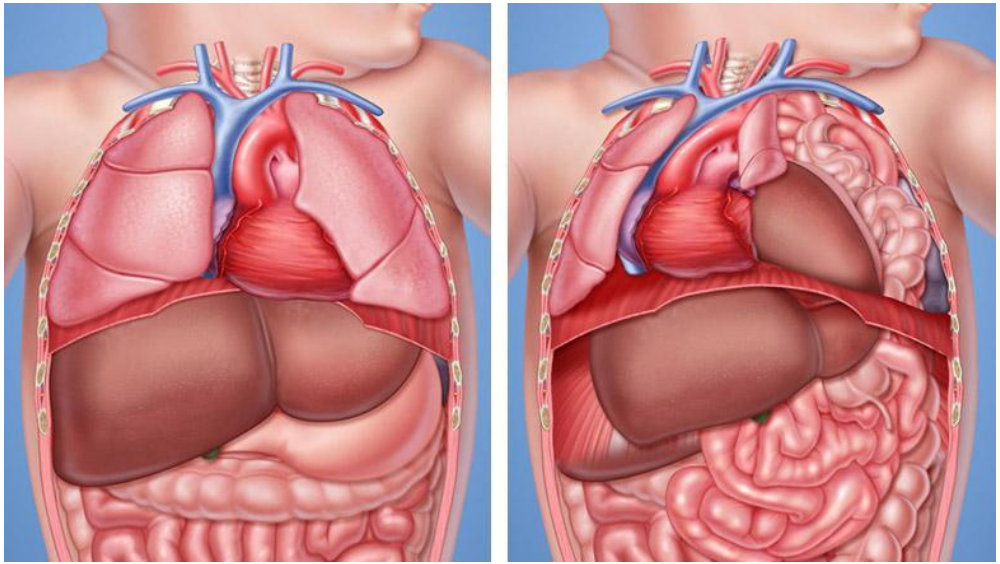
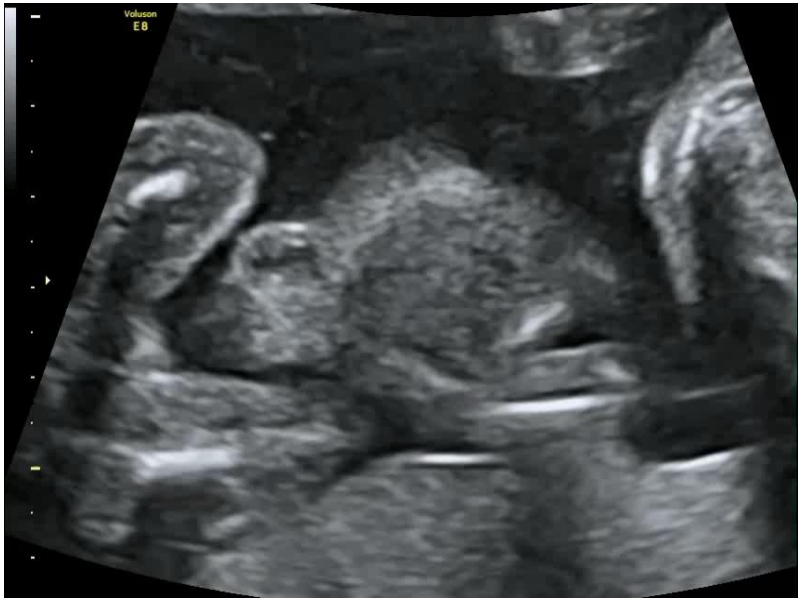
Diaphragmatic hernia

Prevalence 1:3000

- Location:
  - left 85%
  - right 13%
  - bilateral 2%



Coronal plane – diaphragm



Coronal plane - intestines

Echogenic bowel = as white as bone, never decide on your own

Key points

1. Fetal head and heartbeat visible on first longitudinal plane
2. You can exclude anencephaly and encephalocele
3. With the sagittal plane you can exclude spina bifida, sacrococcygeal teratoma and sacral agenesis
4. The coronal plane of the spine allows you to confirm your assessment of the spine and recognition of abnormal findings
5. With the coronal plane of the body assessment of the fetal stomach position, diaphragm and intestines is achieved
6. Abnormal situs and left sided diaphragmatic hernia can be excluded
7. Echogenic bowel is a subtle finding, always consult with a supervisor