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

1. What is the purpose of starting the scan with overview 1?

2. What are the key ultrasound features of plane 1?

3. What probe movements are required to move from plane 1 to plane 2?

4. 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 head
Anencephaly

Always confirm any suspected anomaly in more than one 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 of spina bifida
  - U-shaped open vertebra
  - Meningocele - cyst
  - Myelomeningocele - cyst with neural tissue

Koshood et al. BMJ 2015, 351:5949
Plane 1 (sagittal spine)
Embryology spine

7 weeks

40 weeks

Primary ossification centers

Cartilage

Vertebral arch

Neurocentral joint

Costovertebral synchondrosis

Rib

Centrum
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
Plane 1 (sagittal spine)
Incorrect sagittal planes of the spine
Features of plane 1 (sagittal spine)

- 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 between spine and fetal skin consistent along the length of the spine
- Amniotic fluid between the fetal skin and the wall of the uterus

From sagittal to coronal plane

Angle
Plane 2 (coronal spine)
Plane 2 (coronal spine) - sacral segments
Features of plane 2 (coronal spine)

- Three echoes from the ossification center of the vertebral body, centrally, & 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

- 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
Sacral agenesis – Plane 1 (sagittal spine)
Sacroccygeal teratoma – Plane 1 (sagittal spine)
Sacroccocygeal 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
Plane 3 (Coronal body)
Features of plane 3 (Coronal body)

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

Prevalence 1:3000
• Location:
  - Left 85%
  - Right 13%
  - Bilateral 2%
Plane 3 (Coronal body) – diaphragm
Plane 3 (Coronal body) - intestines

Echogenic bowel = as white as bone (iliac crest or femur) never decide on your own

Basic Training
Key points

1. Fetal head & heartbeat are visible in the first longitudinal plane
2. This plane excludes anencephaly & encephalocele
3. The sagittal plane allows exclusion of spina bifida, sacrococcygeal teratoma & sacral agenesis
4. The coronal plane of the spine allows confirmation of the assessment of the spine & recognition of abnormal findings
5. The coronal plane of the body allows assessment of the fetal stomach position, diaphragm & intestines
6. Abnormal situs & left sided diaphragmatic hernia can be excluded
7. Echogenic bowel is a subtle finding, always seek the opinion of a supervisor
ISUOG Basic Training by ISUOG is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

Based on a work at https://www.isuog.org/education/basic-training.html.

Permissions beyond the scope of this license may be available at https://www.isuog.org/