



ISUOG Basic Training

Distinguishing between Normal & Abnormal
Appearances of the Long Bones & Extremities

Learning objectives

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

- Describe how to obtain the planes required to assess the four limbs correctly
- Recognise the differences between the normal & most common abnormal ultrasound appearances of the legs, arms & extremities

Planes

15	Limbs	Femur diaphysis length
16		3 long bones of both legs, both feet & normal relationships to both legs
17		3 long bones of both arms, both hands & normal relationships to both arms

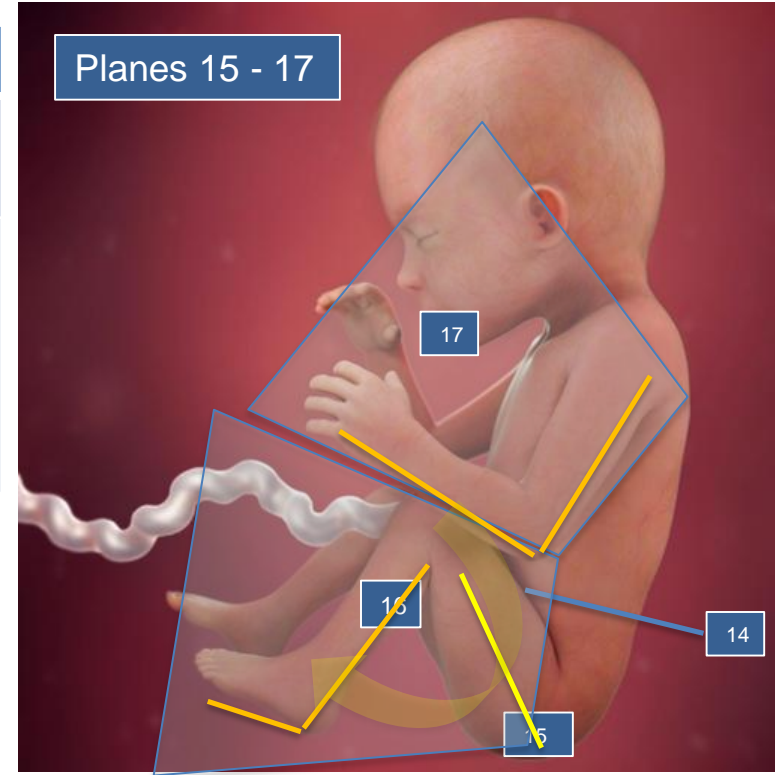
Moving through the 20 planes

Plane	Description
14	Transverse section of pelvis, bladder, both umbilical arteries
15	Femur diaphysis length*
16	3 bones of both legs, both feet & normal relationships to both legs
17	3 bones of both arms, both hands & normal relationships to both arms

From plane 14 to 15 – slide & rotate

From plane 15 to 16 – slide, rotate (& angle)

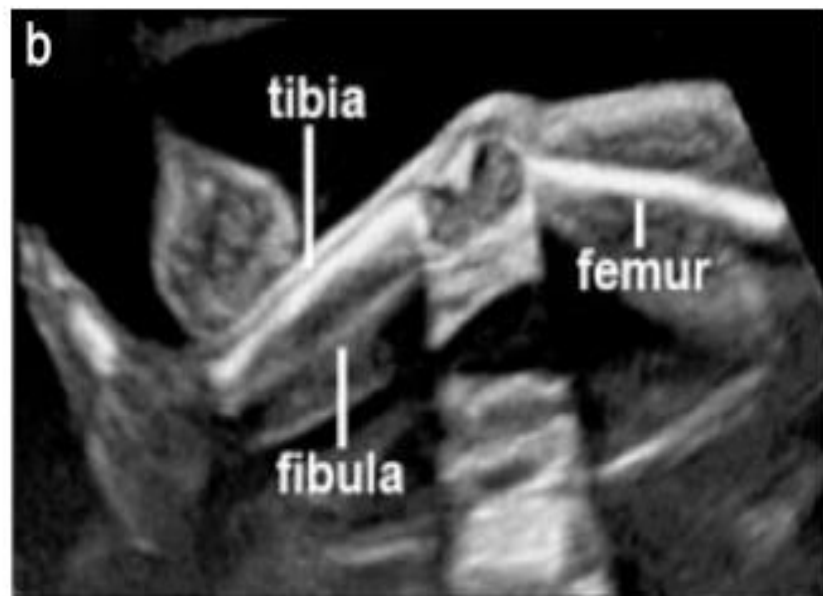
From plane 14 to 17 – slide to upper chest, rotate (& angle)



* 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 encephalocoele, skin oedema, ventriculomegaly
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), situs inversus/ambiguous, tetralogy of Fallot, transposition, univentricular heart
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
15-17	Limbs	FL outside normal range of size chart



Key questions

- What are the key ultrasound features of plane 15 (femoral diaphysis length)?
- What are the key ultrasound features of plane 16 (the leg)?
- What are the key ultrasound features of plane 17 (the arm)?
- Which probe movements are required to image the 3 long bones of a limb & extremity correctly?
- Which abnormalities should be excluded after correct assessment of planes 15, 16 & 17?

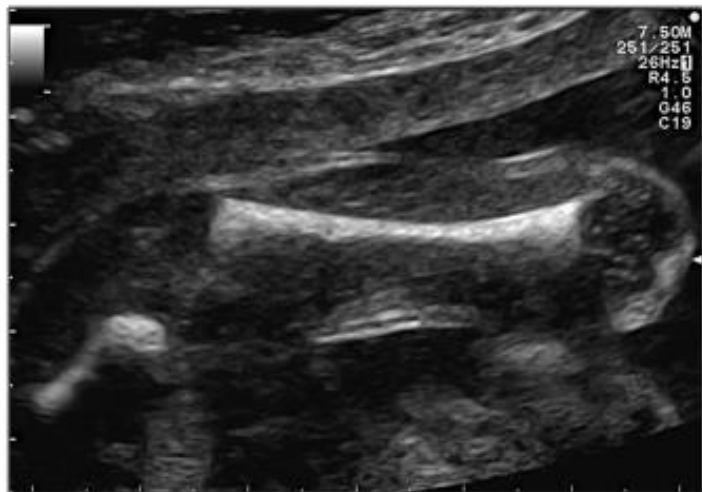
What are the key ultrasound features of plane 15 (femur diaphysis length)?

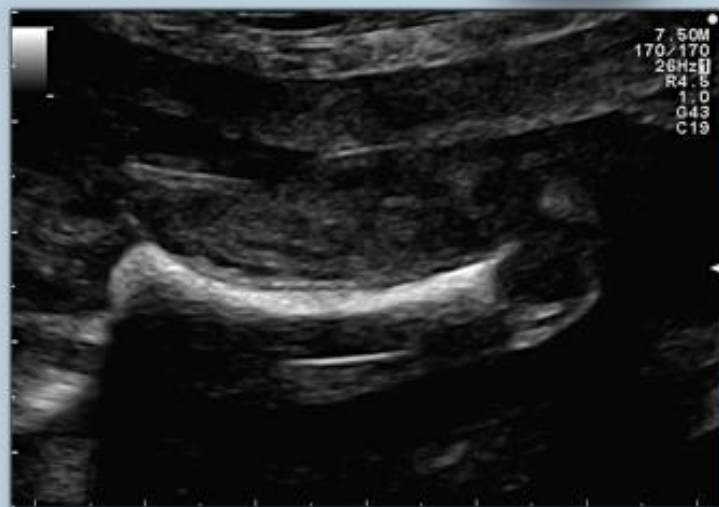


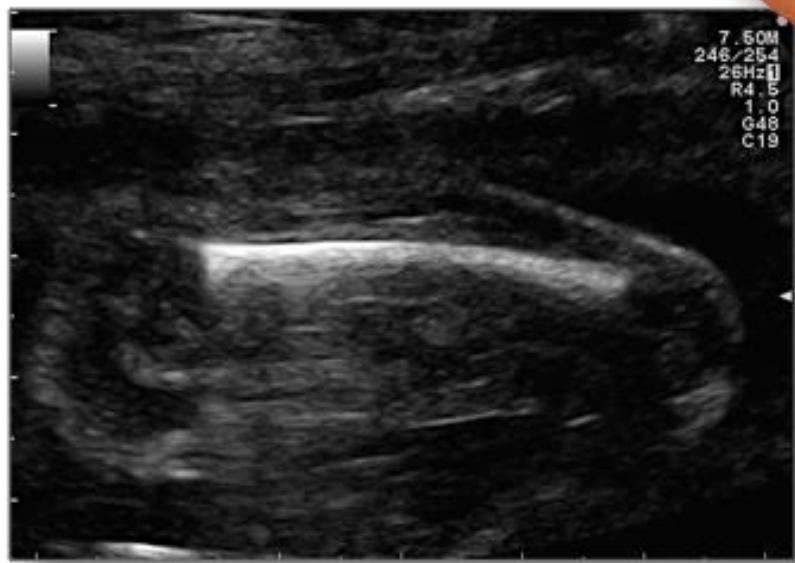
- Focal zone at appropriate level.
- Image magnified.
- Whole femur diaphysis imaged.
- Ultrasound beam perpendicular to long axis of femur.
- Calipers placed at each end of ossified diaphysis.
- Longest visible diaphysis is measured.
- Spur artifacts on end of diaphysis not included in measurement.

What are the key ultrasound features of plane 16 (femur diaphysis length)?

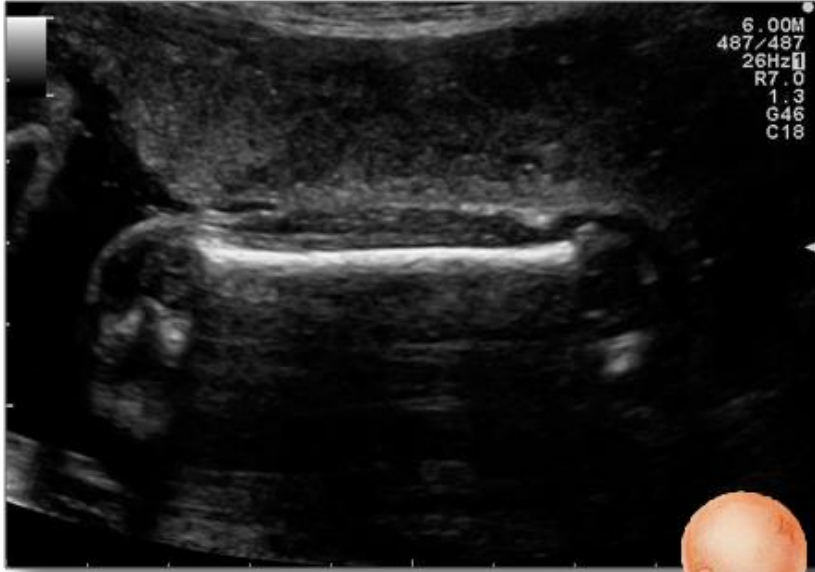
	BPD	AC	FL
1	Symmetrical plane	Symmetrical plane	Both ends of the bone clearly visible
2	Plane showing the thalami	Plane showing the stomach bubble	<45° angle to the horizontal
3	Plane showing the cavum septi pellucidi	Plane showing the portal sinus	Femoral plane occupying more than half of the image size
4	Cerebellum not visible	Kidneys not visible	Calipers placed correctly
5	Head plane occupying more than half of the image size	Abdominal plane occupying more than half of the image size	-
6	Calipers and dotted ellipse placed correctly	Calipers and dotted ellipse placed correctly	-
TOTAL SCORE			





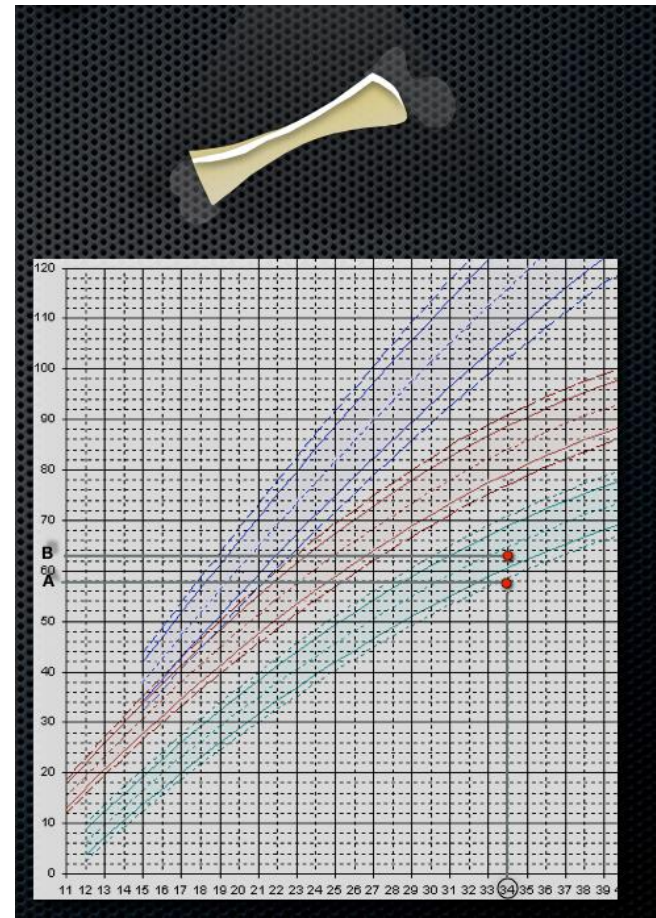
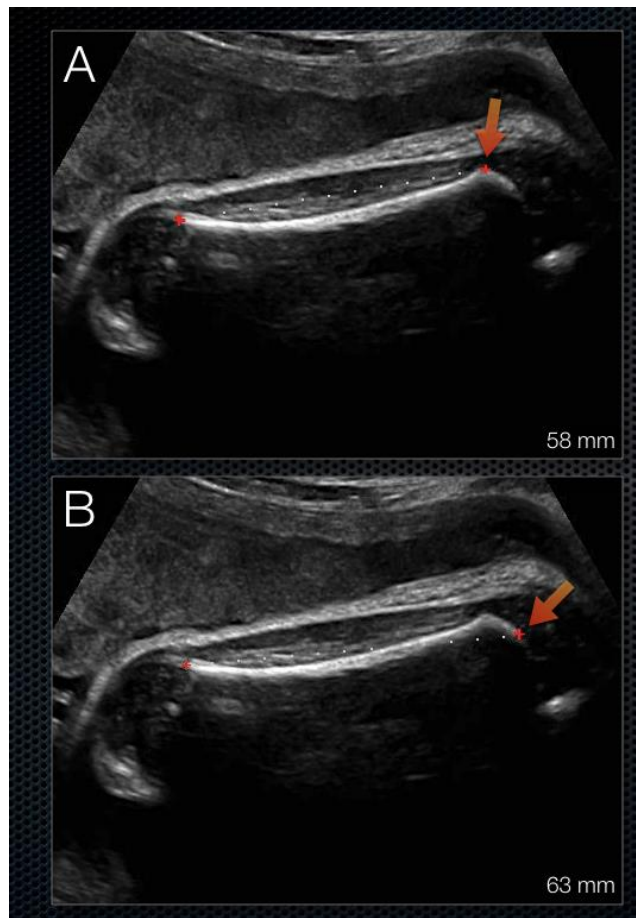


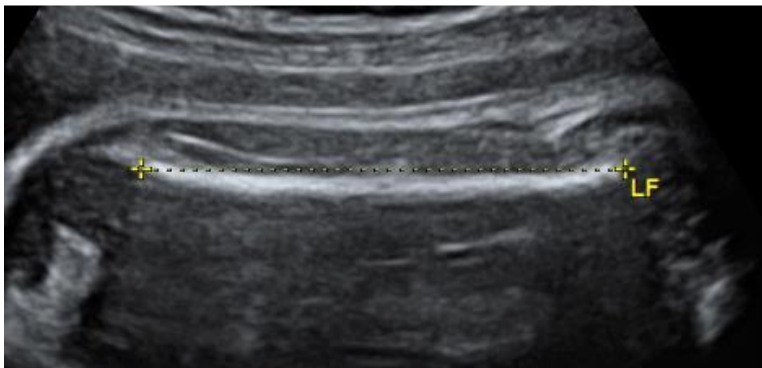
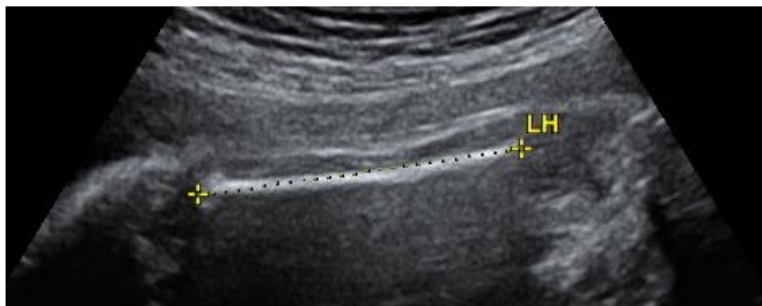
It is better to have an orthogonal approach of femoral diaphysis



Orthogonal approach and measuring the antero-external side







What are the key ultrasound features of plane 16 (the leg)?

- Number of bones
- Length
- Echogenicity
- Shape
- Position
- Movements

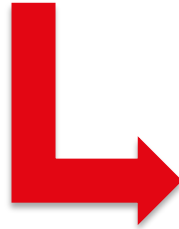
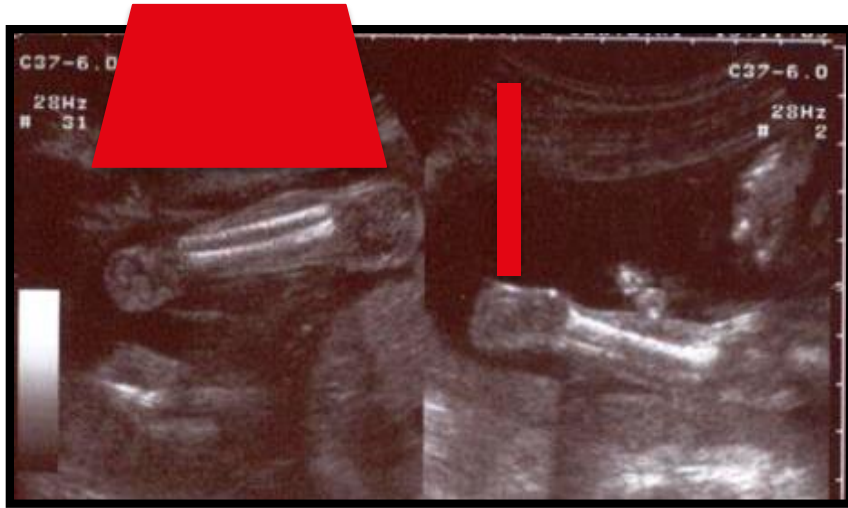


What are the key ultrasound features of plane 16 (the leg)?



- 90 degrees rotation
- Translation towards the foot

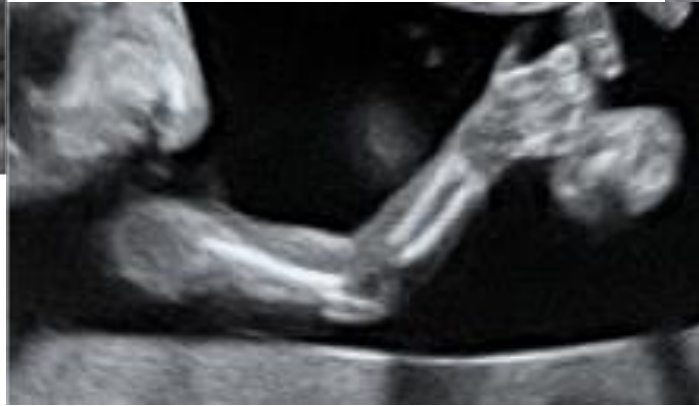
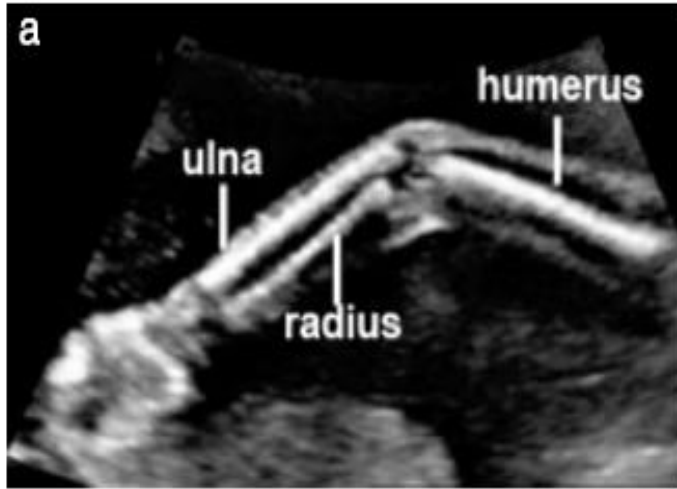
What are the key ultrasound features of plane 16 (the leg)?



- 90degrees rotation
- Translation towards the foot



What are the key ultrasound features of plane 17 (the arm)?

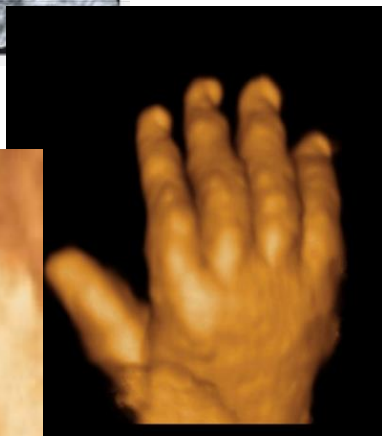
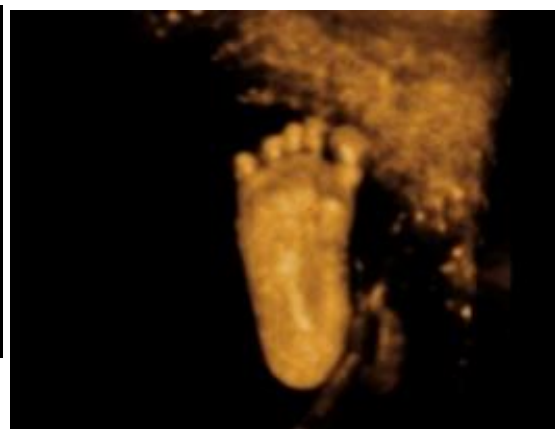




Guidelines

- The presence or absence of both arms/hands and both legs/feet should be documented using a systematic approach.
- Counting fingers or toes is not required as part of the routine mid-trimester scan

1- Practice guidelines for performance of the routine midtrimester scan (UOG 2011; 37:116-126)



Which abnormalities should be excluded after correct assessment of planes 15, 16 & 17?

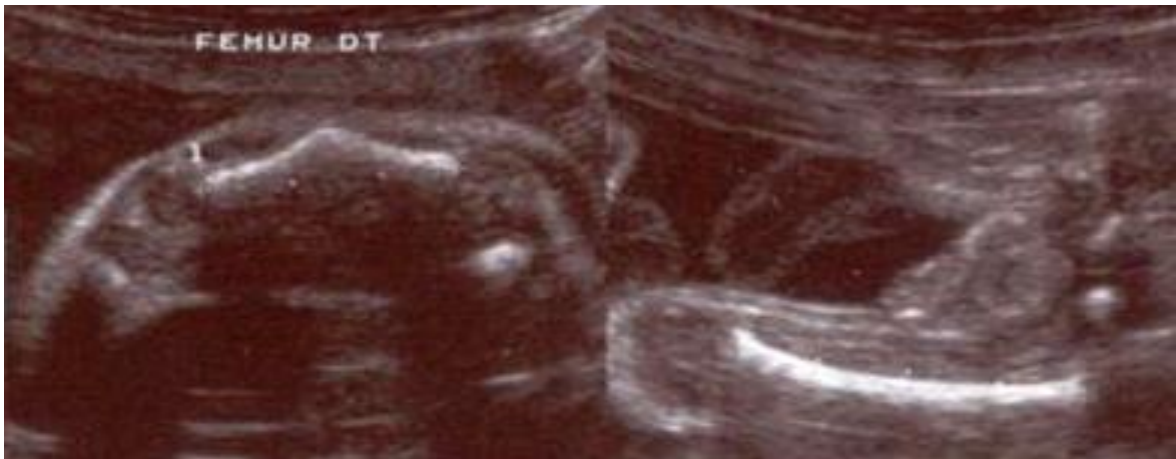
- Number of bones
- Length
- Echogenicity
- Shape
- Position
- Movements

Which abnormalities should be excluded after correct assessment of planes 15, 16 & 17?

- Number of bones: agenesis...
- Length: short femur...
- Shape: curved, fracture...
- Position : Talipes,...
- Movements: fixed,...
- (Echogenicity: Osteogenesis Imperfecta...)

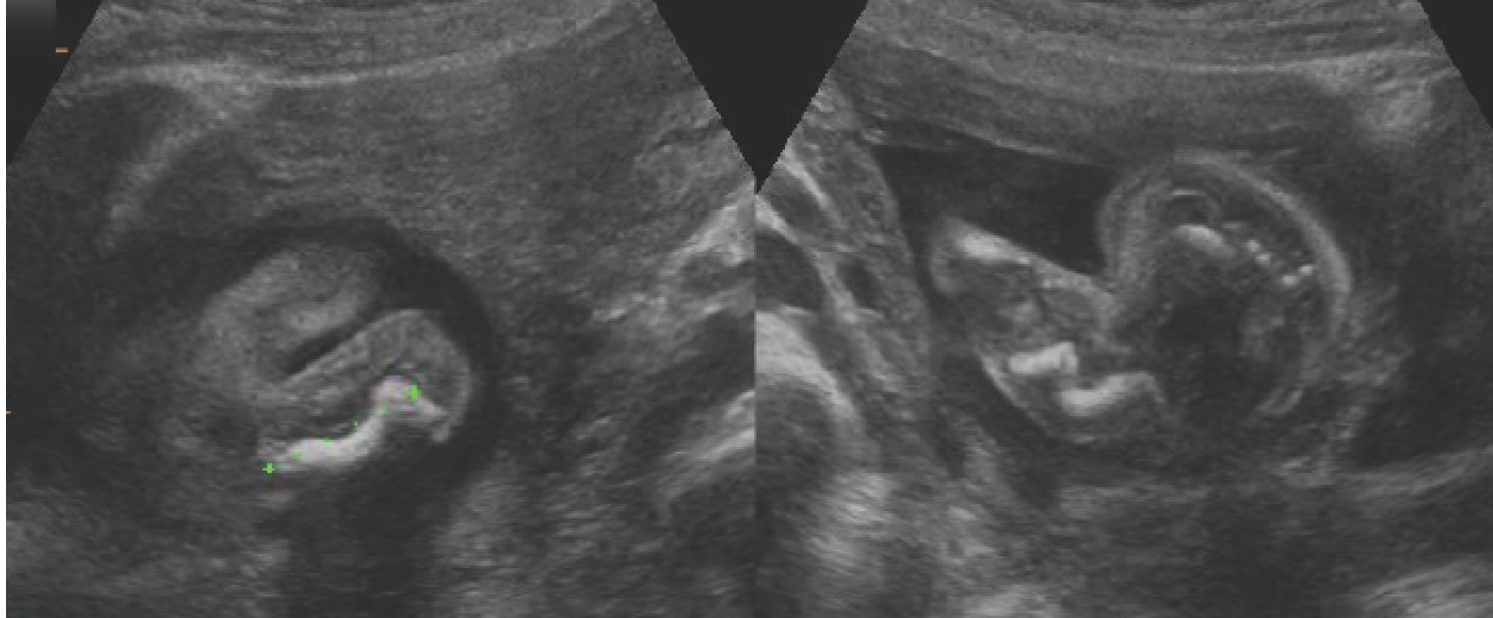
Shape

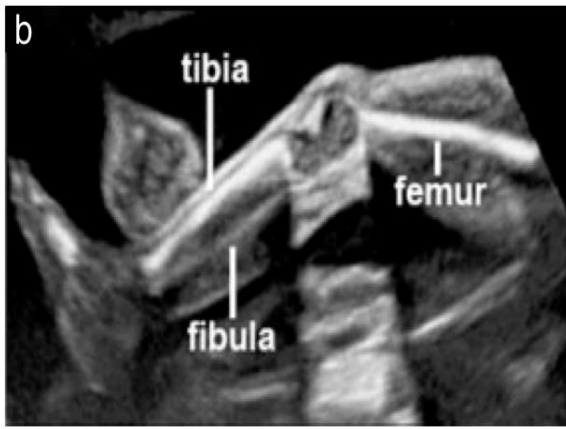
- Short?
- Curved?



Shape

- Short?
- Curved?
- Fracture?

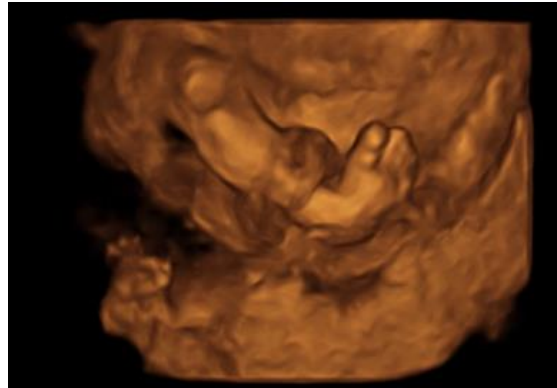


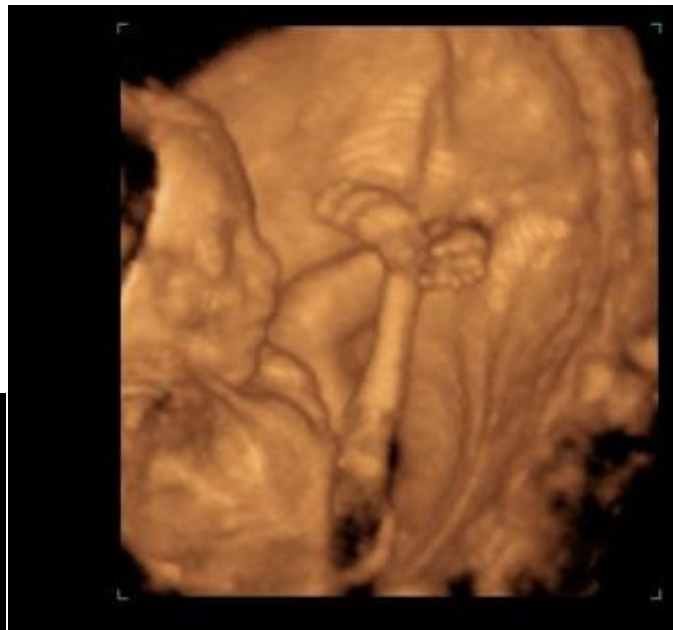


Position: Talipes



Talipes

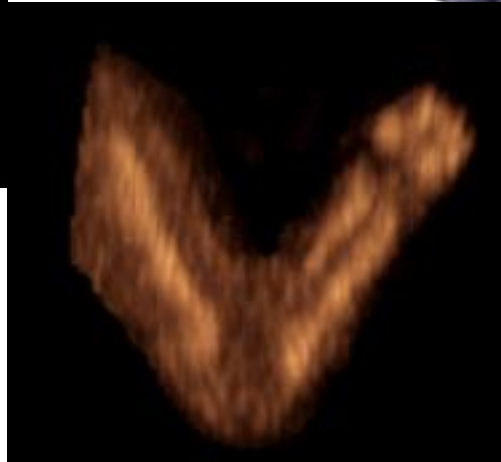
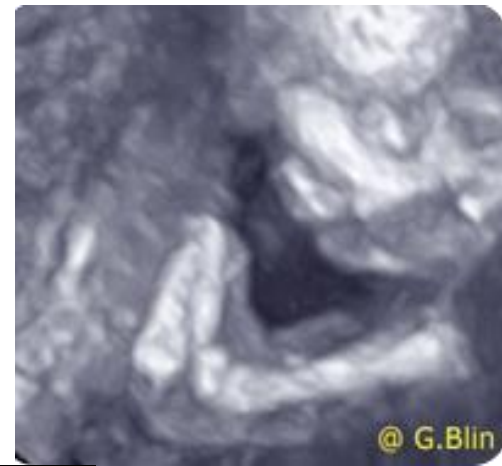




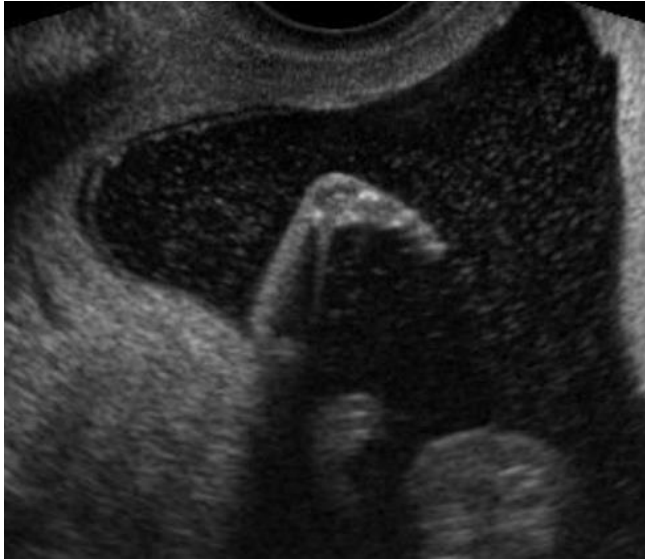
Number : Radial agenesis



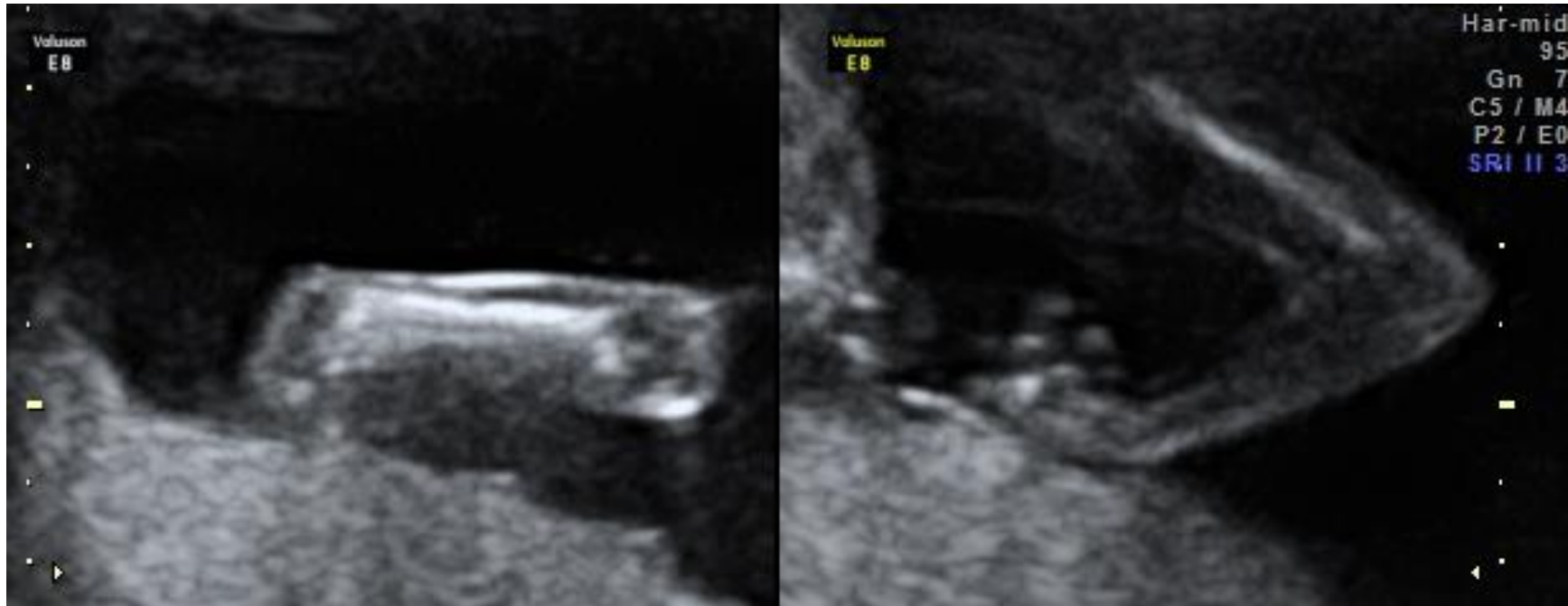
Number



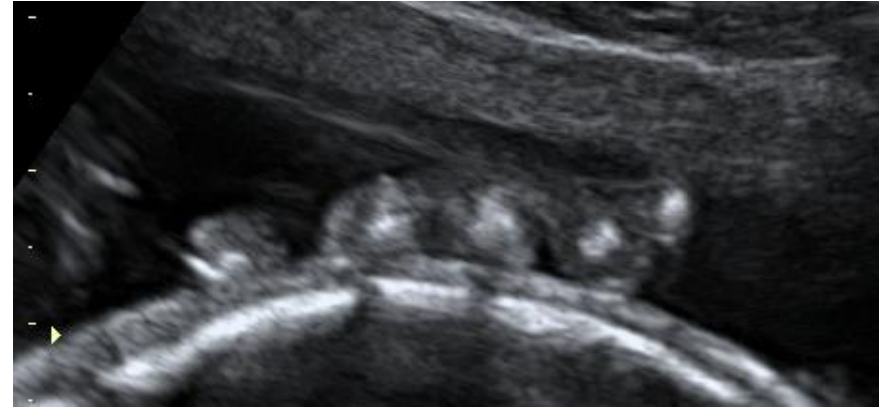
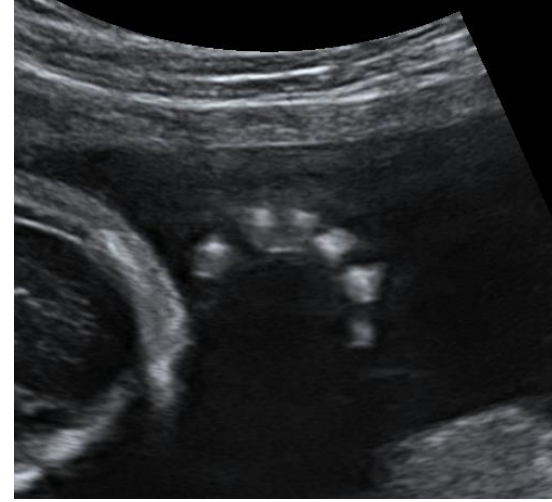
Position-Movements



Movements

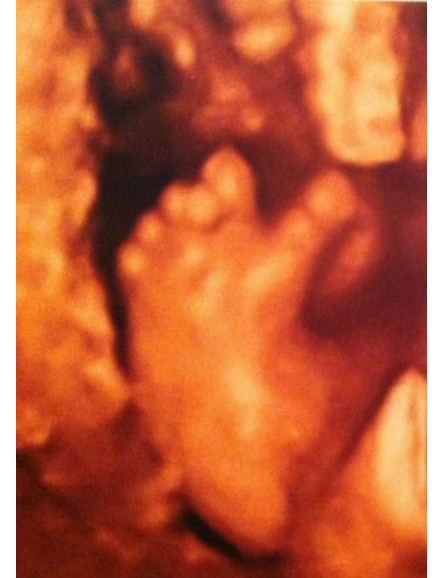


Polydactyly



Polydactyly

- Normal



Dr BAULT JP

Key points

1. Planes 15, 16 and 17 allows identification of the most common pathologies of the limbs
2. Always check number of bones, shape, position and movements
3. Your role is to distinguish between the range of normal & abnormal appearances
4. Any appearance which you cannot confirm as normal should be referred for a more experienced opinion.



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/>**