

“Basic fetal ultrasound exam”

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CHU Sainte-Justine

*Le centre hospitalier
universitaire mère-enfant*

Pour l'amour des enfants

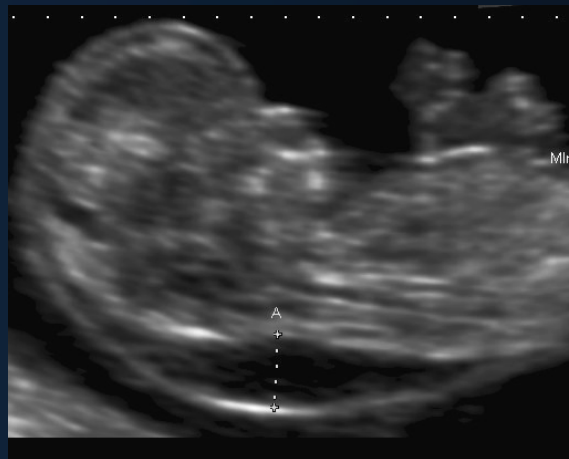
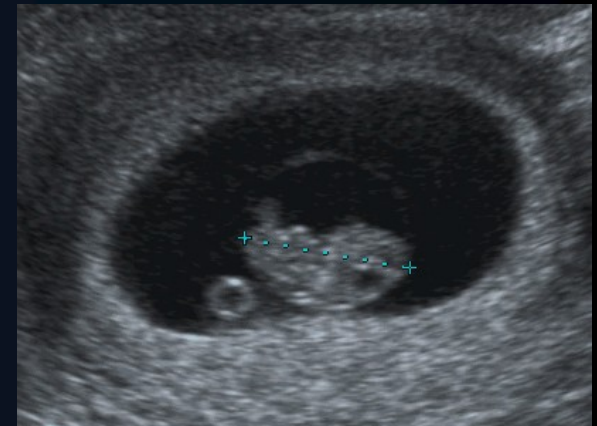
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What is a fetal basic ultrasound?

- Accurate diagnostic information
 - gestational age, growth
 - anatomy (anomaly detection)
 - number of fetuses
- Guidelines (ACR, ACOG, AIUM, ISUOG, CAR*, SOGC*..)
 - 1st T / 2nd T / 3rd T
 - = minimal requirements

Guidelines: 1st Trimester

- Location of pregnancy (gestational sac, yolk sac, embryo)
- Gestational age: CRL (mean gestational sac diameter), bpd
- Cardiac activity (> 5 mm)
- Number: chorionicity, amnionicity
- « appropriate anatomy » (nuchal region)
- Uterus (cervix), adnexae, cul-de-sac



Basic 2nd T fetal US: who / when?

- For all pregnancies
- 18 – 22 wga (compromise datation / anatomy / management)
(13 – 16 wga)
- Well trained professionals
- Up to date equipment
- ALARA (time and power exposure)



13 wga



Basic 2nd T fetal US: how?

6 steps:

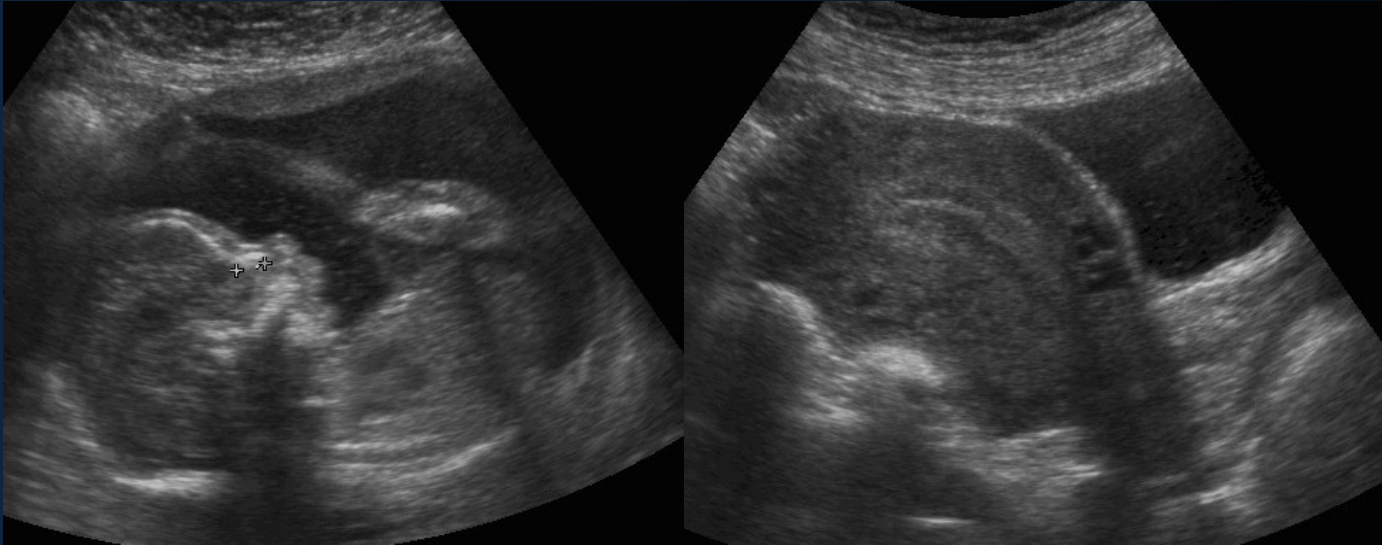
- 1. Viability, location
- 2. Number
- 3. Biometry
- 4. Basic anatomy
- 5. Environment
- 6. Information transmission (report / documentation)

1: fetal viability

- Heart beating
 - N: 120 – 160 bpm
 - physiological variations
 - ! Bradycardia < 110 bpm
 - ! Persistent tachycardia > 160 bpm
- Fetal motion
 - body, extremities



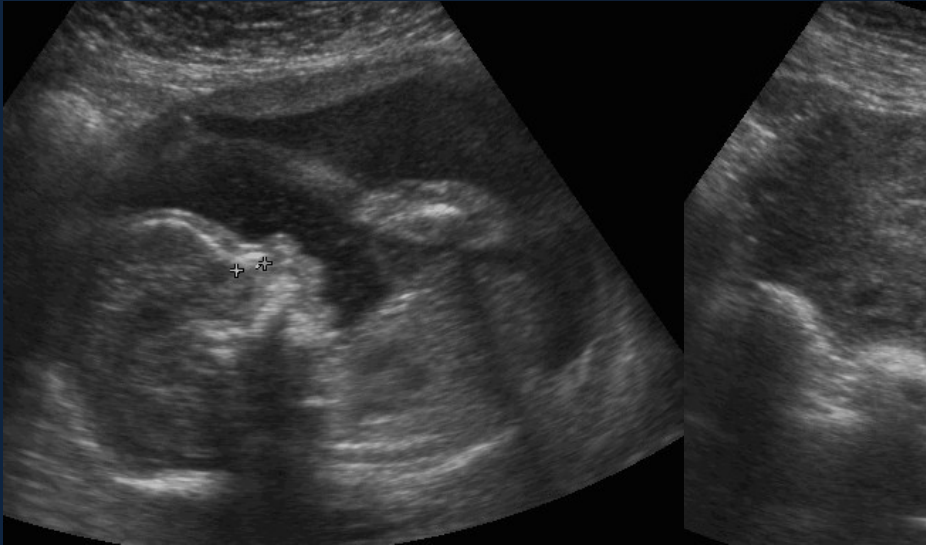
1: fetal location



19 wga, routine US

1: fetal location

- Verify!



19 wga, routine US

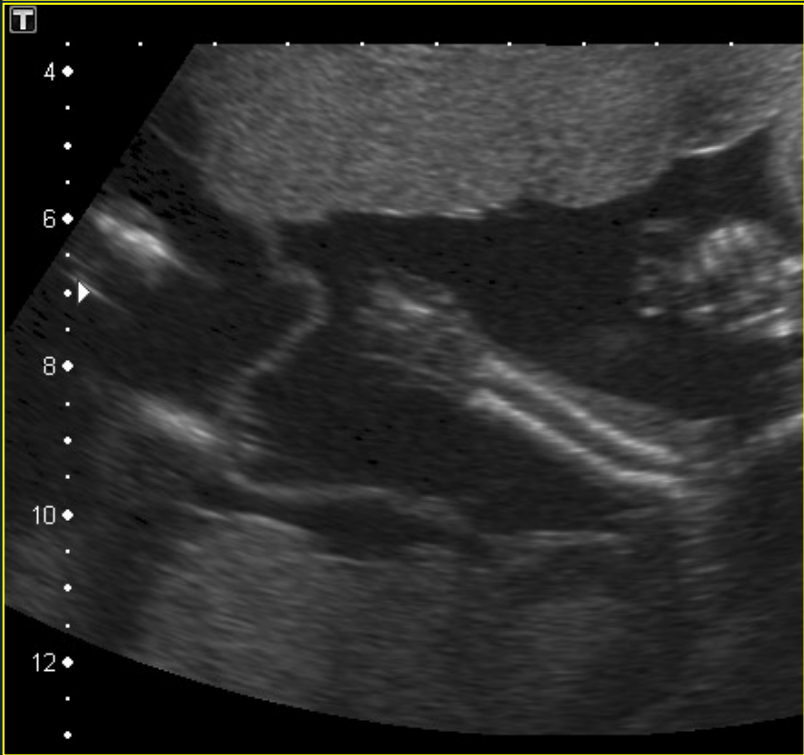
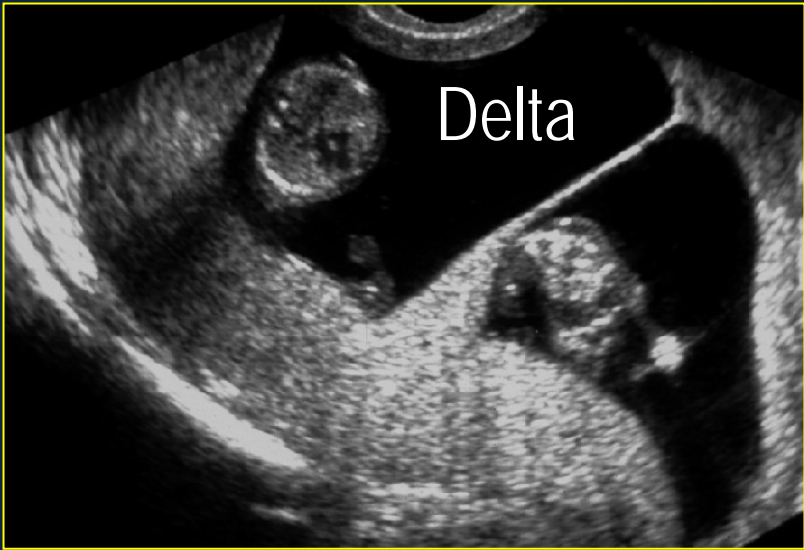


2: twinning

- 1st T the best timing
- Mandatory:
chorionicity / amnionicity



	Dichorionic	Monochorionic Diamniotic	Monochorionic monoamniotic
Placenta	2	1	1
Membrane	thick	thin	⊗
	Δ, twin peak	λ	⊗
Gender	= / ≠	=	=
entangled cords	⊗	⊗	+



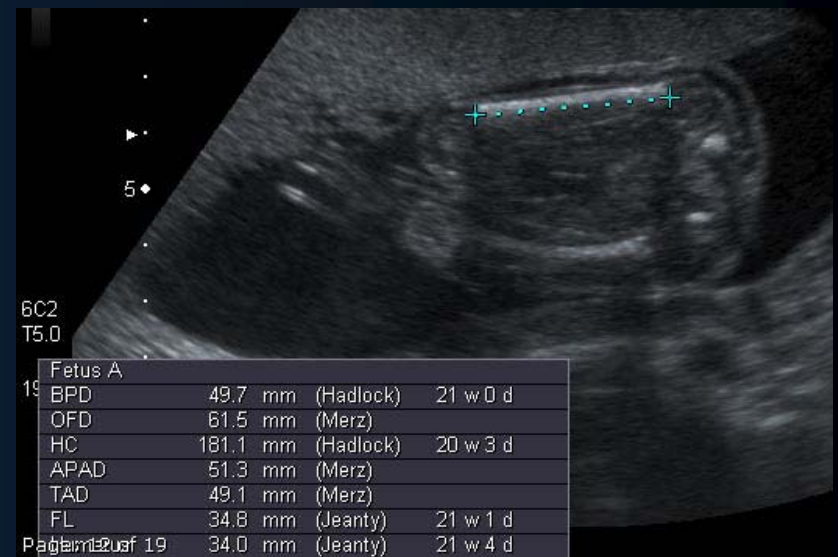
Lambda

3: biometry: requisites

- Purpose: {
 - gestational age
 - growth
 - aneuploidy, malformation?
- Biparietal diameter
- Fronto-occipital diameter / head circumference
- Mean abdominal diameter / abdominal circumference
- Femoral diaphysis length

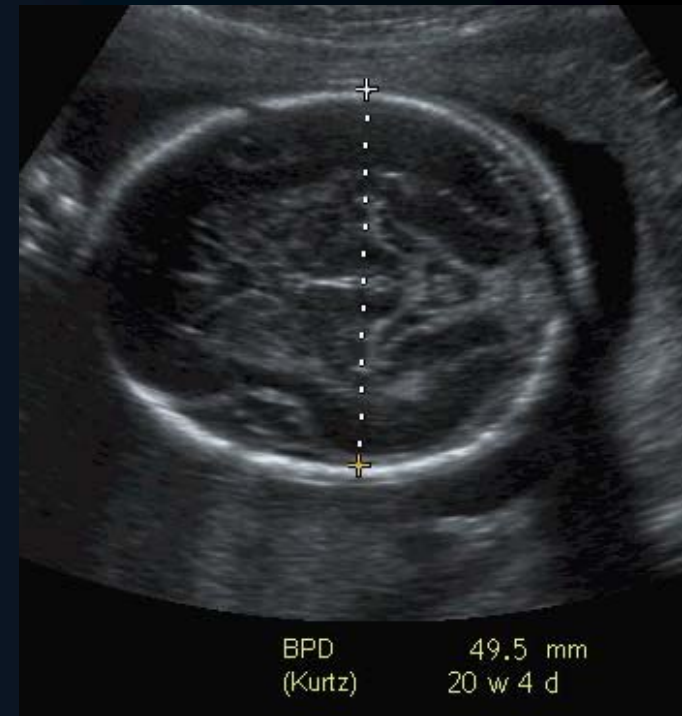
3: biometry: general principles

- Rigorous technique
- Repeated measurements
- Same technical requirements than the charts used
- Charts adapted to the population
- Report: percentiles (gest age). Z score, mean for gest age, curves,.....



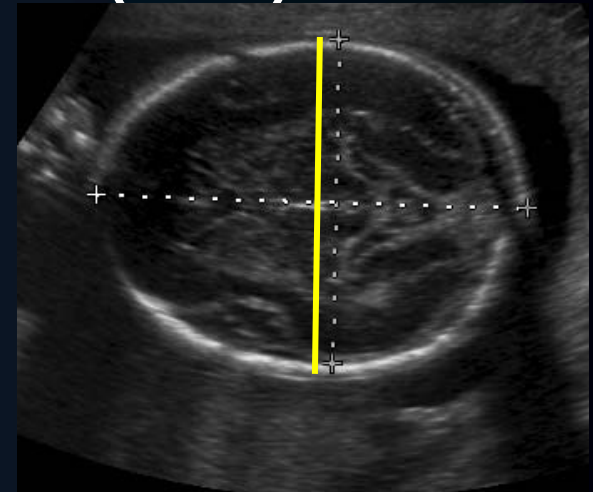
Biparietal diameter (bpd)

- Axial view (thalami)
perpendicular insonation to the falx
symmetrical appearance of hemispheres
- Measurements perpendicular / midline
leading edge technique (outer / inner)
(> outer / outer)
- Gest age +/- 7 days (12 – 19 wga)

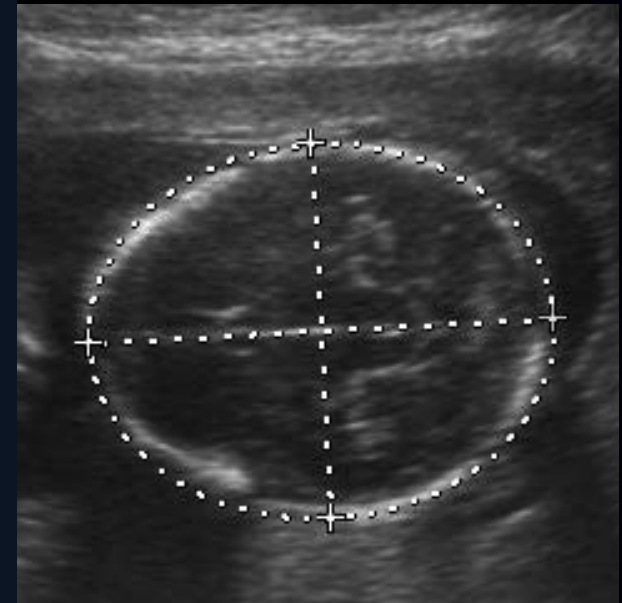


Head circumference (HC)

- Axial, symmetrical
parallel to the skull base
midline falx – cavum SP – thalami –
ambient cistern
⊗ cerebellum
- outer – outer
- $HC = 1,57 (bpd + fod)$
- Gest age +/- 4,2 days (16 – 19 wga)

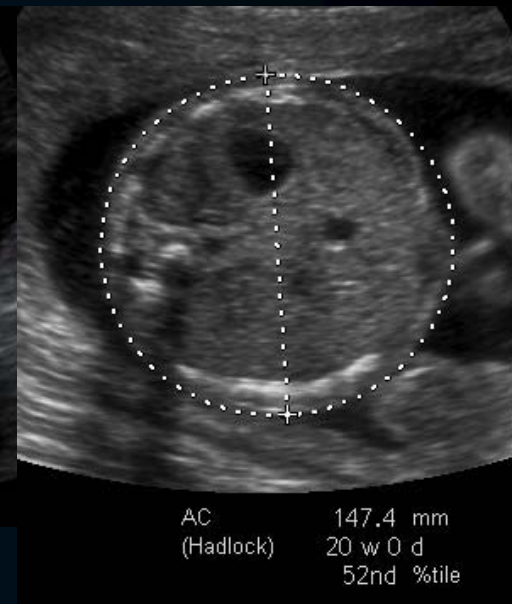
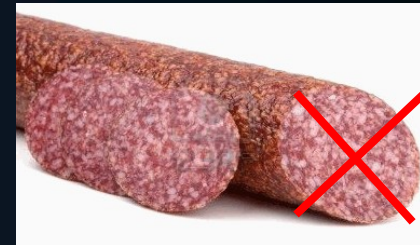


OFD 65.9 mm
(Merz) 21 w 2 d
+/- 6.0 mm



Abdominal circumference (AC) / mean abdominal diameter

- Axial scan: round !
(< 5 mm diam discrepancy)
symmetrical ribs
stomach
umbilical vein – portal sinus
confluence
adrenal (no kidney)
- Outer surface of the skin



Femoral diaphysis length

- Technique:
 - most proximal femur
 - insonation angle < 60 degree
 - cartilaginous ends
 - longest axis of diaphysis
- NB: distal spur artifact
 - both femurs
 - (1 – 2 mm discrepancy N)



4: basic fetal anatomy

- Be SYSTEMATICAL
= the only way not to miss something major
- Standard scans ...and a little bit more

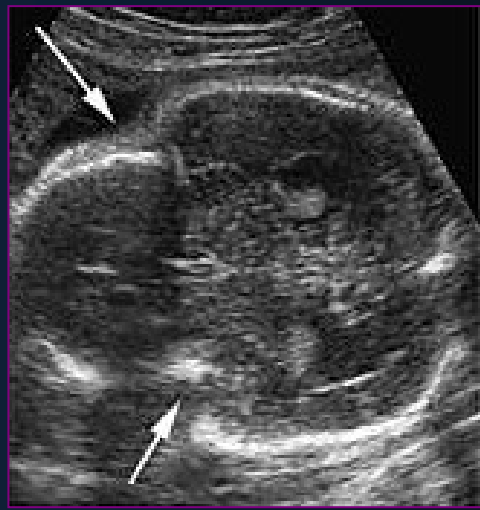
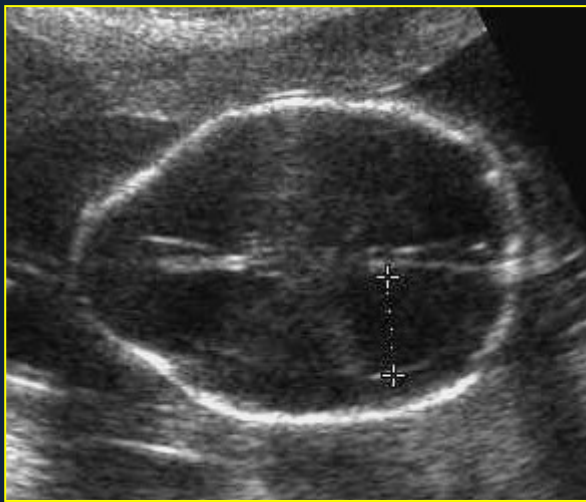
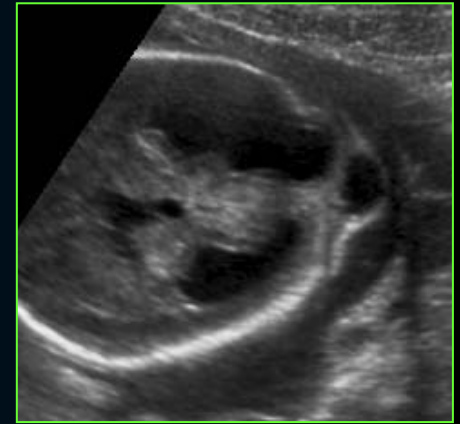
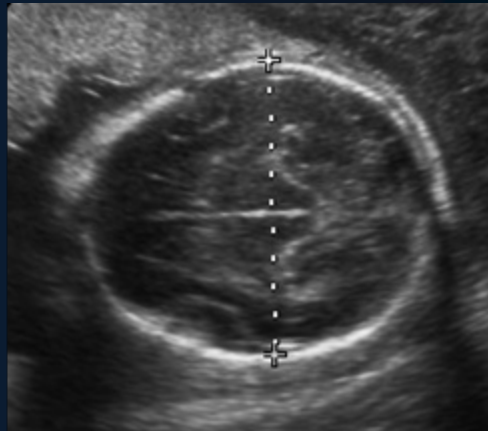


Fetal head

- REQUISITES:
- Skull: integrity, shape, size, bone density
- Hemispheres: ventricles, atria, choroid plexus
- Midline: falx, cavum
- Posterior fossa: cerebellum, cisterna magna

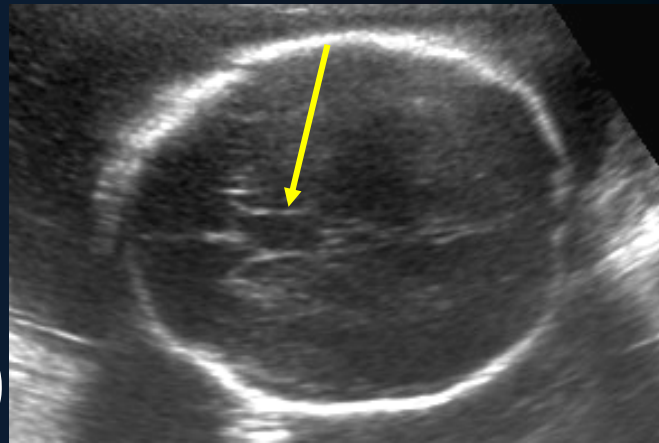
Fetal head: skull

- Size (bpd, fod, hc)
- Shape: N oval & regular
- Integrity
- Density

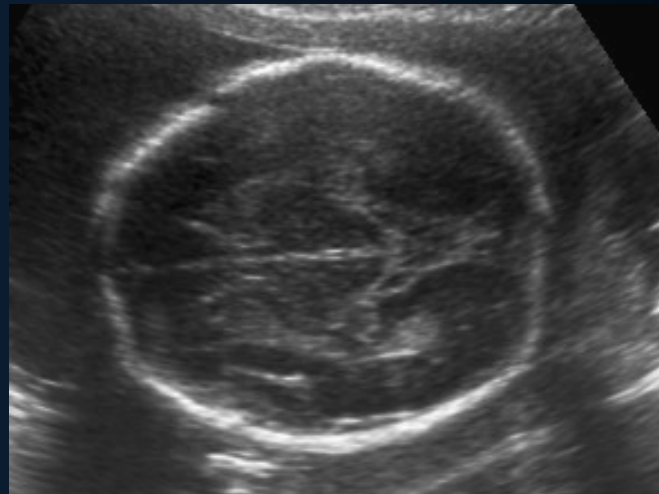
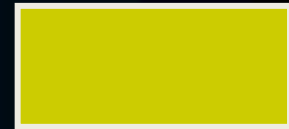


Fetal head: hemispheres

- 2 hemispheres
- MIDLINE:
 - falx
 - cavum SP (16 – 37 wga)
 - (Corpus callosum)



Cavum SP



Fornix

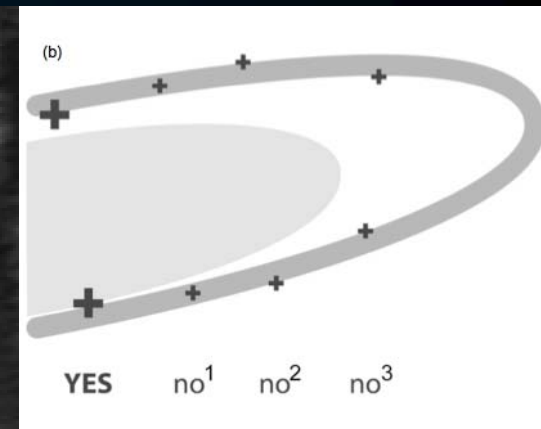
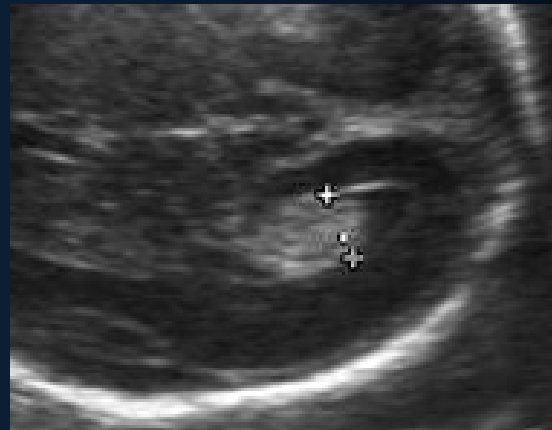


Fetal heads: ventricles

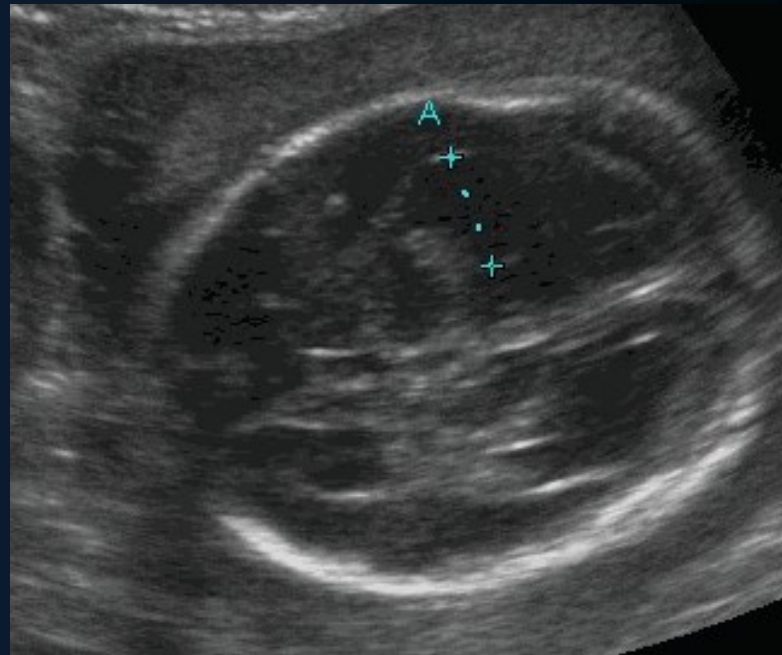
- Axial scan
- Landmarks:
 - cavum SP / fornix / ambient cistern
 - choroid plexus glomus / int Pa-Oc sulcus
 - perpendicular to V axis
 - int / int



- $N < 10$ mm

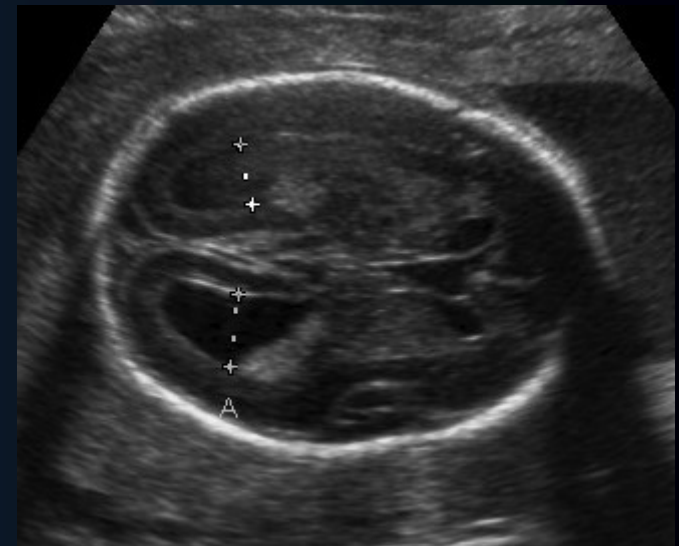
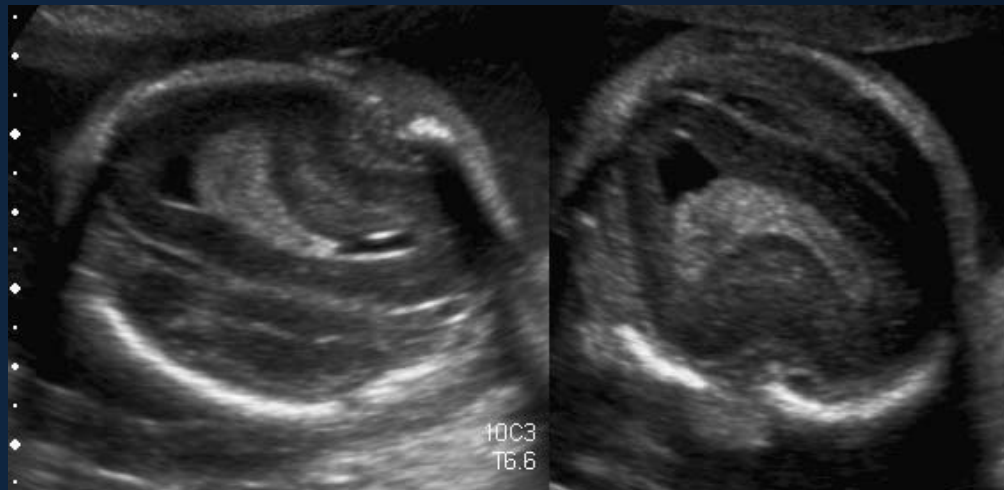


- 2 ventricles!



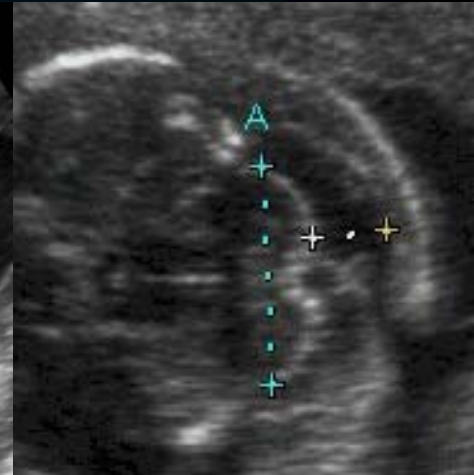
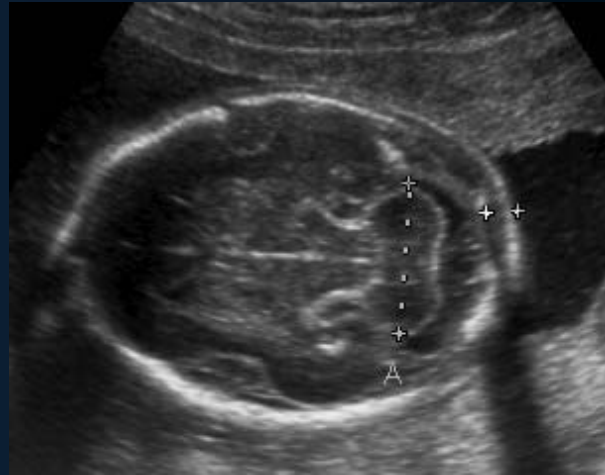
Choroid plexus

- Homogeneous
- ⊗ in frontal / occipital horns
- Fill the atrium
- Wall – plexus < 3 mm



Posterior fossa

- Cerebellum:
2 hemispheres
1 vermis

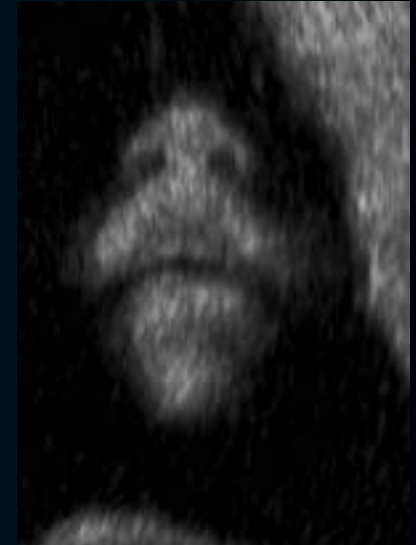
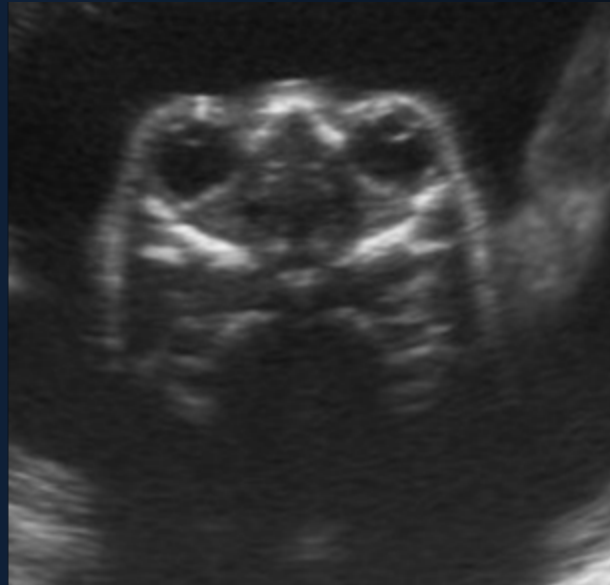


- Transversal diam (ext / ext) ~ nb wga < 23 wga
- Cisterna magna
2 – 10 mm
thin septa

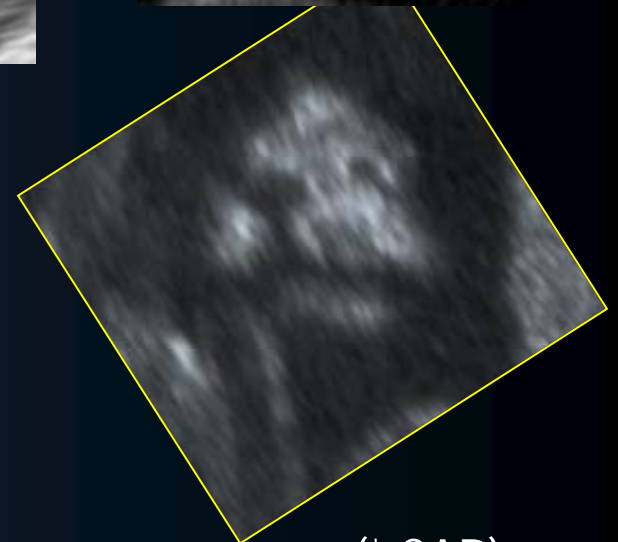


Face

- GUIDELINES:
2 orbits
mouth
upper lip
nose / nostrils*



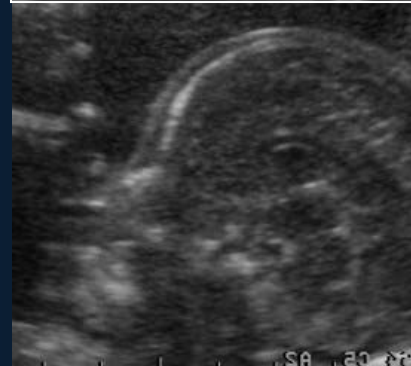
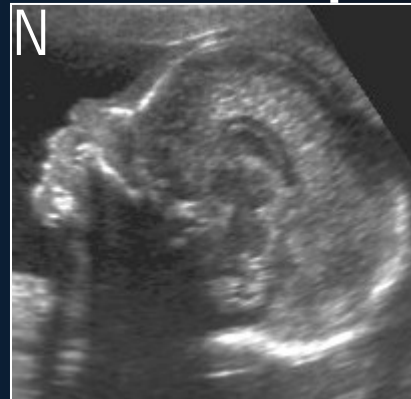
- NB: orbits: rule of 3
center / center ~ wga



(* CAR)

Median facial profile!

- ⊗ in guidelines
- Very useful:
 - skull
 - brain
 - face
 - clefts
 - ...

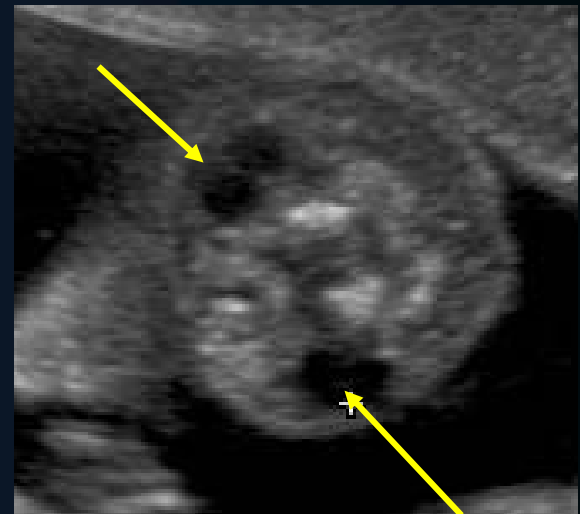


Neck

- GUIDELINES:
 - ⊗ mass
 - nuchal fold (16 – 20 wga)*
- Axial: thalami / cerebellum
- Skin to bone (ext / ext)

- Ste Justine:
 - 14 – 17 wga: < 5 mm
 - 17 – 21 wga: < 6 mm
 - (LHR T 21 = 17)

(* CAR)



Spine

- GUIDELINES:

- ⊗ defect, ⊗ mass
- axial, sagittal views

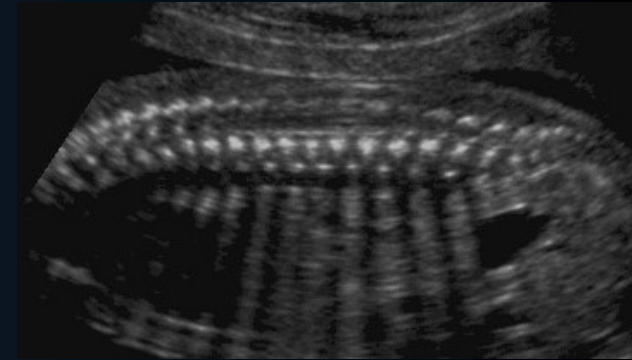
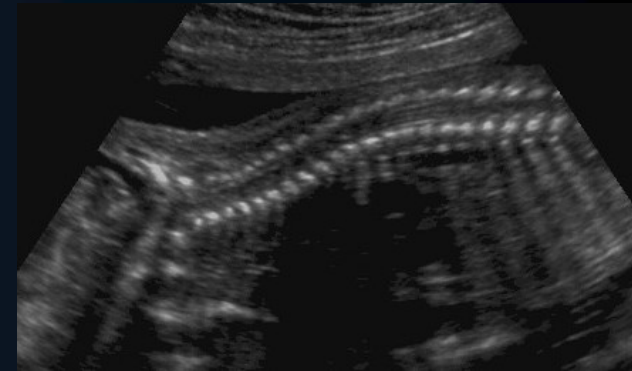


- Min 2 planes

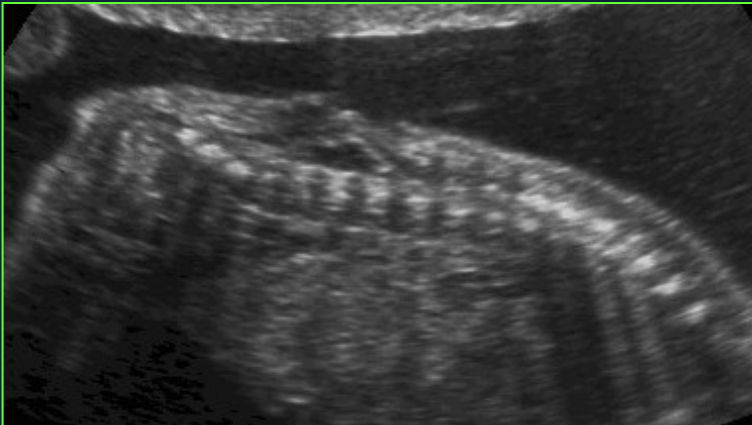
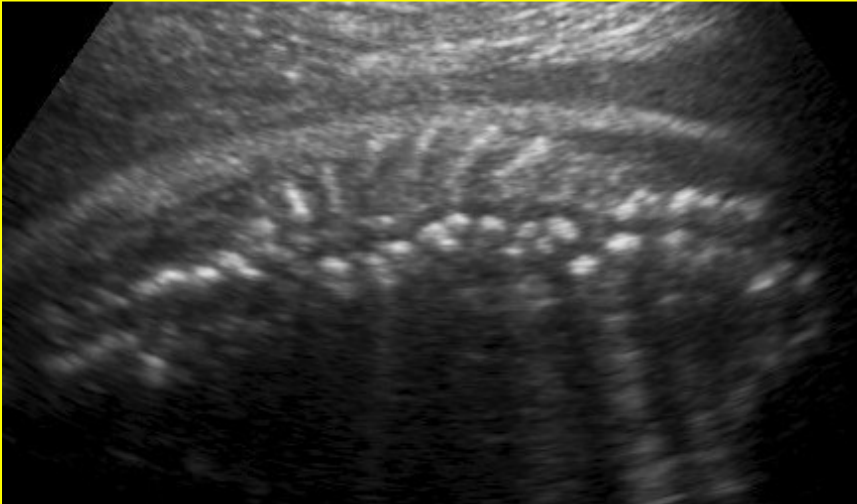
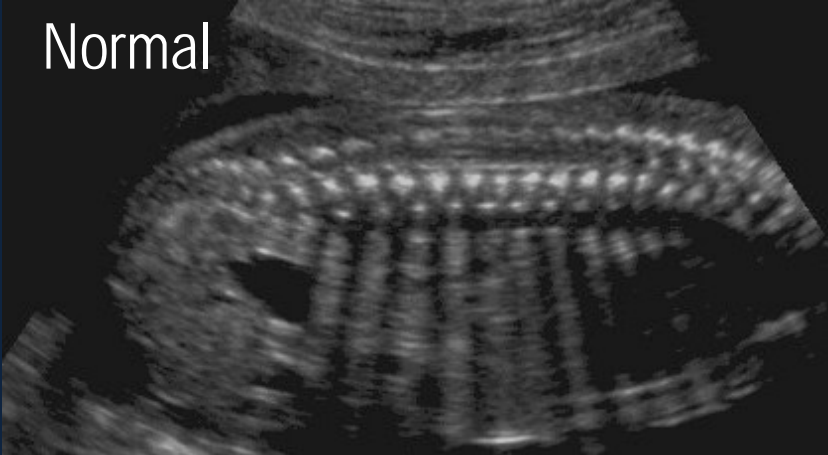
- Skin

- Ossification centers (regular, ⊗ scoliosis)

- Head to rump



Normal



Chest: guidelines

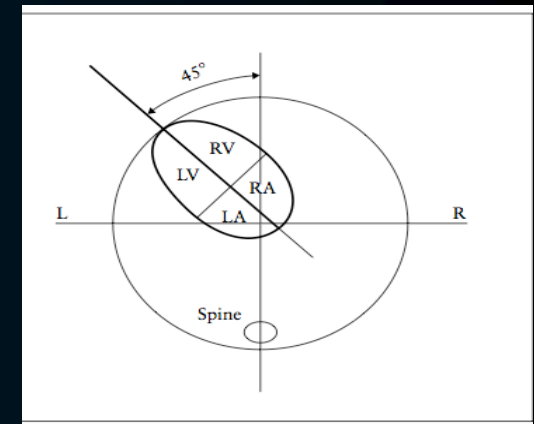
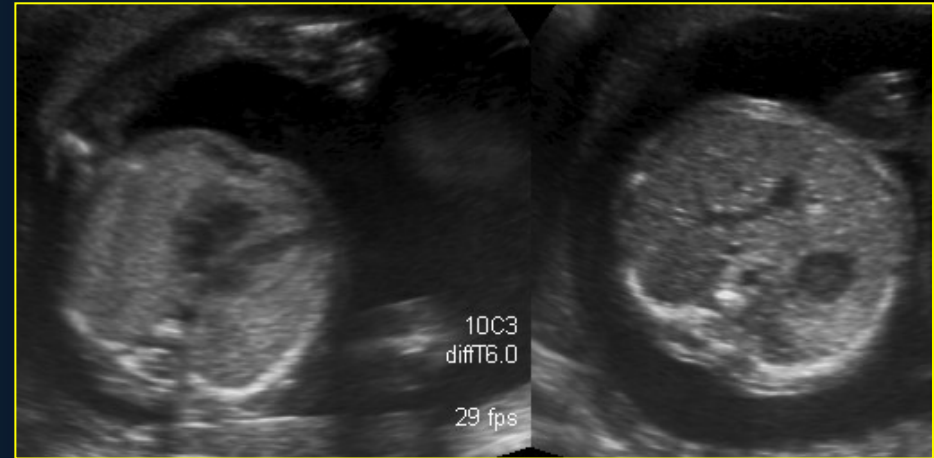
- Size, appearance, shape
- Heart:
 - activity
 - axis, size, position
 - 4 chamber view
 - outflow tracts *
- Lungs
- ⊗ mass
- (diaphragmatic interface)



(* if possible, CAR)

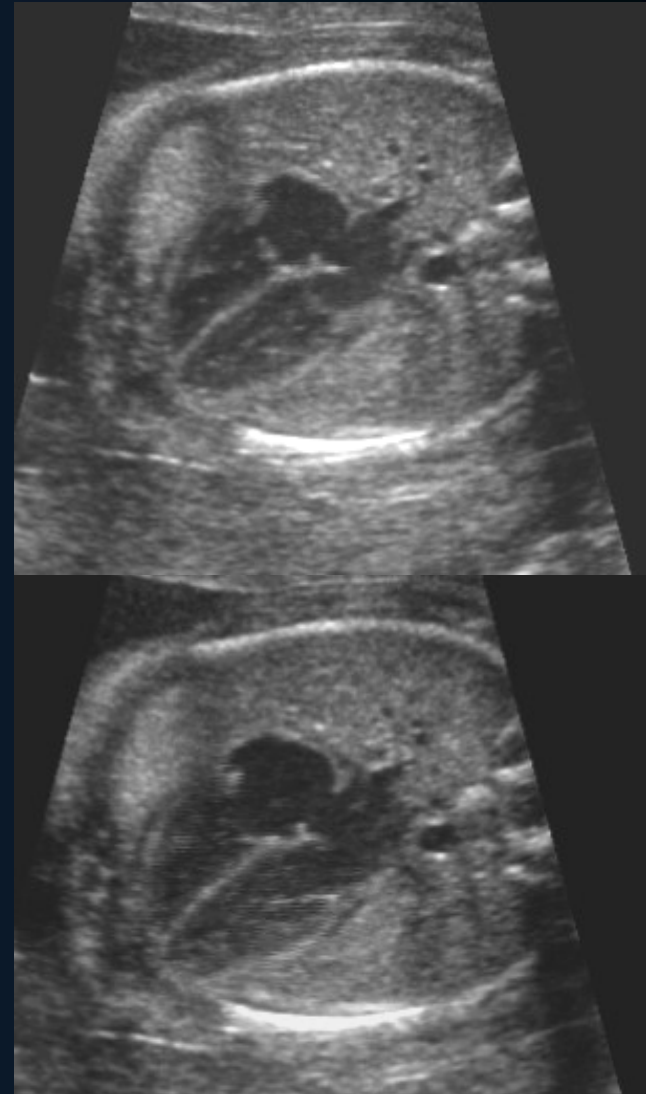
Heart

- N situs
- $< 1/3$ chest area
- $45 \pm 20^\circ$ towards the left
- Majority in left chest
- 120 – 160 bpm
- No pericardial fluid (< 2 mm)



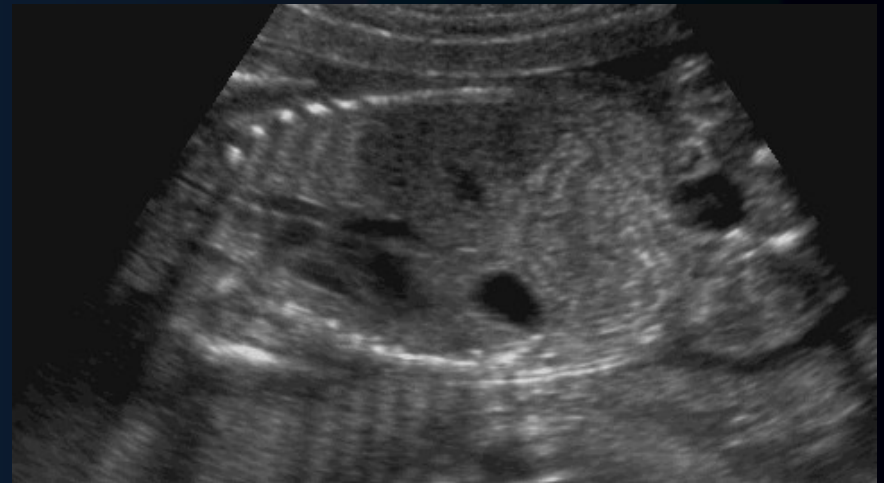
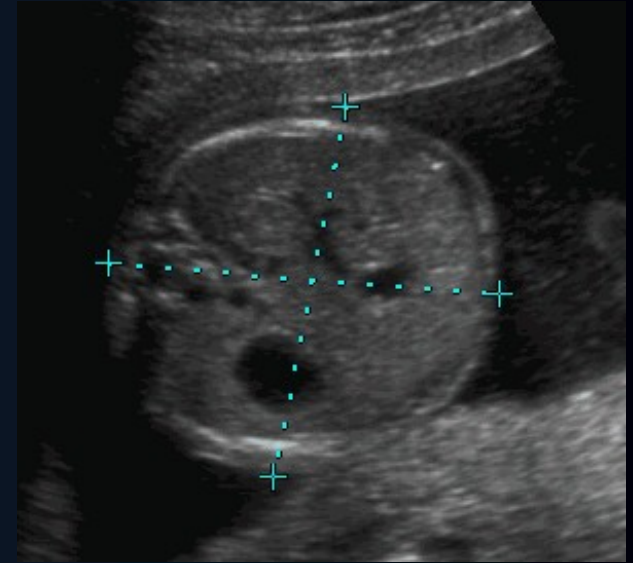
Heart: 4 chamber view

- Atria: L = R
foramen ovale (flap to left)
septum I (crux)
- Ventricles: L = R
septum
moderator band (R)
- Valves: 2!
- NOT ENOUGH!



Abdomen

- GUIDELINES:
 - Stomach (presence, position)
 - N Bowel (< 2 mm, $<$ bone, \ominus fluid)
 - cord insertion (number* of vessels)
 - genitalia* (if medically indicated)



Abdomen: urinary tract

- GUIDELINES:

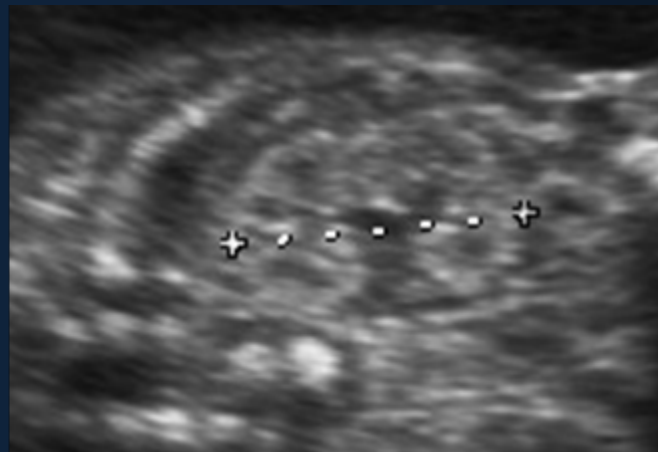
2 Kidneys (! Adrenals)

length = wga

cortico-medullary differentiation > 18 wga

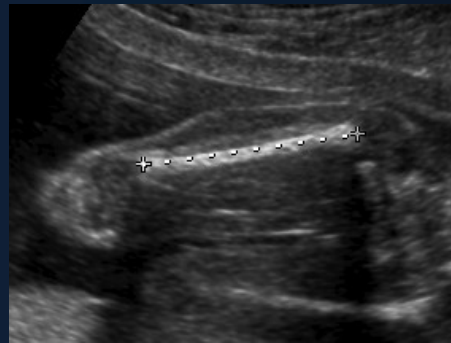
ap pelvis diam < 4 mm (2nd T)

bladder*



Extremities

- GUIDELINES:
 - « 4 limbs to the level of hands & feet »
- not enough
- 2 sides
- proximal to distal
- 3 segments
- motion



5: Fetal environment

- GUIDELINES:

Amniotic fluid (qualitative / semi quantitative)

Placenta (appearance, position / IO)

Pertinent maternal anatomy

uterus (mass, malformation)

cervix

adnexae



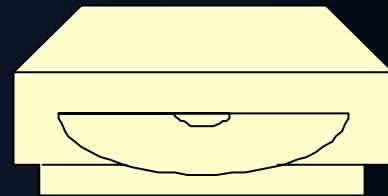
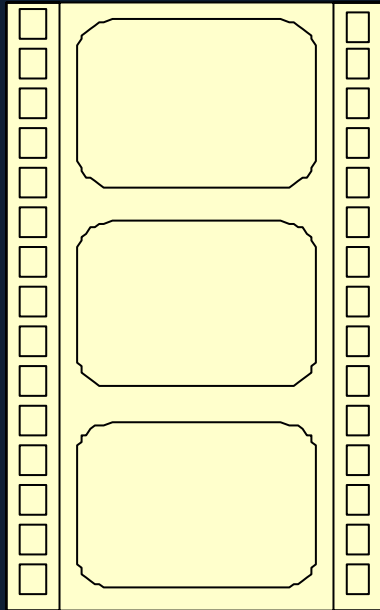
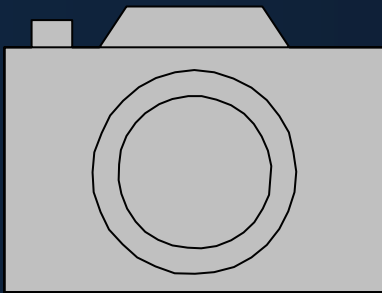
Final step: Transmission of information

- Report:
 - clear, precise, easy to read
 - date of exam
 - gestational age, growth
 - limits of the exam (what & why)
 - anomalies
 - recommandations (follw-up, 3rd level...)
- Inform the patient!



Documentation & archives

- Local legislation
- Minimum: the requisites of scientific societies!



Please, go beyond the guidelines of
scientific societies



Suggested lectures

- ACR, AGOC, AIUM practice guidelines for performance of obstetrical ultrasound
- ISUOG, CAR, SOGC guidelines
- J US Med 2010, 29: 157-166
- US Obstet Gynecol 2007, 29: 109-116 (CNS)
- US Obstet Gynecol 2006, 27: 107-113 (heart)
- JOGC 2009, 31 (3): 272-275
- JOGC 2011, 38 (6): 643-656