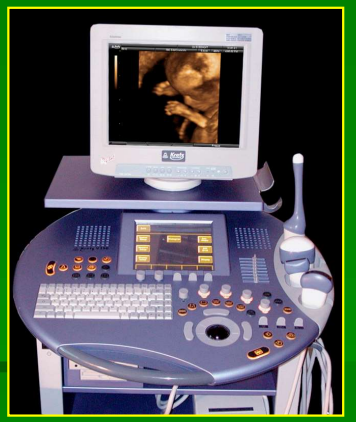
# Ultrasound Assessment of Early Pregnancy

from OVULATION



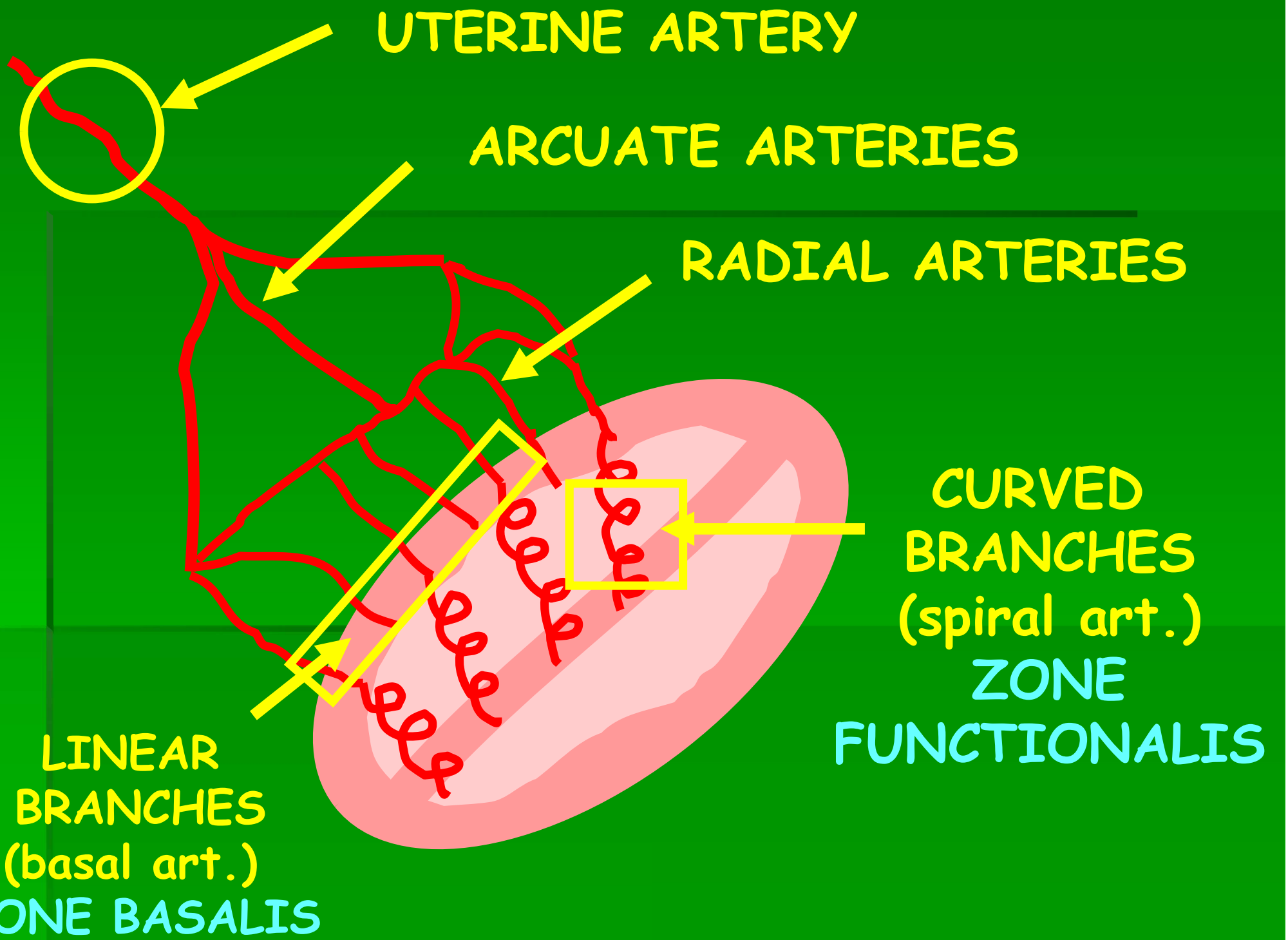
THE ONLY PERIOD OF GESTATION NOT DETECTED DIRECTLY

to

IMPLANTATION

# First Week of Development Ovulation to Implantation (not visible by ultrasound)

- Fertilization occurs at the ampullary region of the fallopian tube.
- The diploid number of chromosomes are restored.
- Chromosomal sex is determined.
- In the fifth day, the blastocyst is embedded in a well prepared, thick endometrium.


UTERINE ARTERY
ARCUATE ARTERIES
RADIAL ARTERIES
CURVED BRANCHES (spiral art.) ZONE FUNCTIONALIS
LINEAR BRANCHES (basal art.) ZONE BASALIS

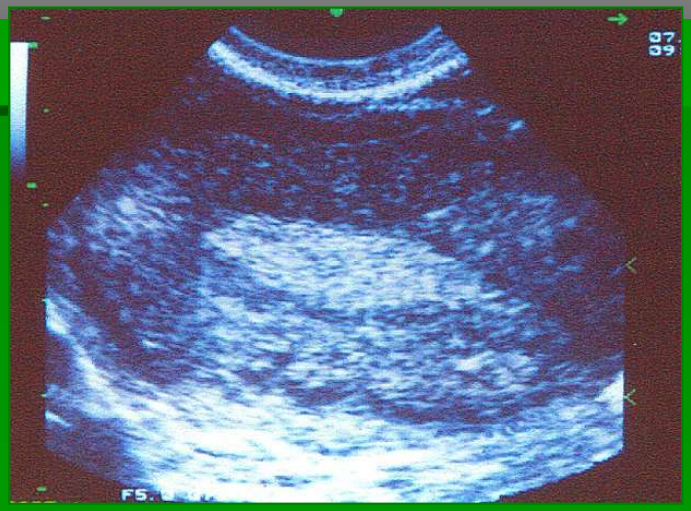
## ENDOMETRIUM GRADE III

SCHEMATIC ULTRASONIC APPEARANCE

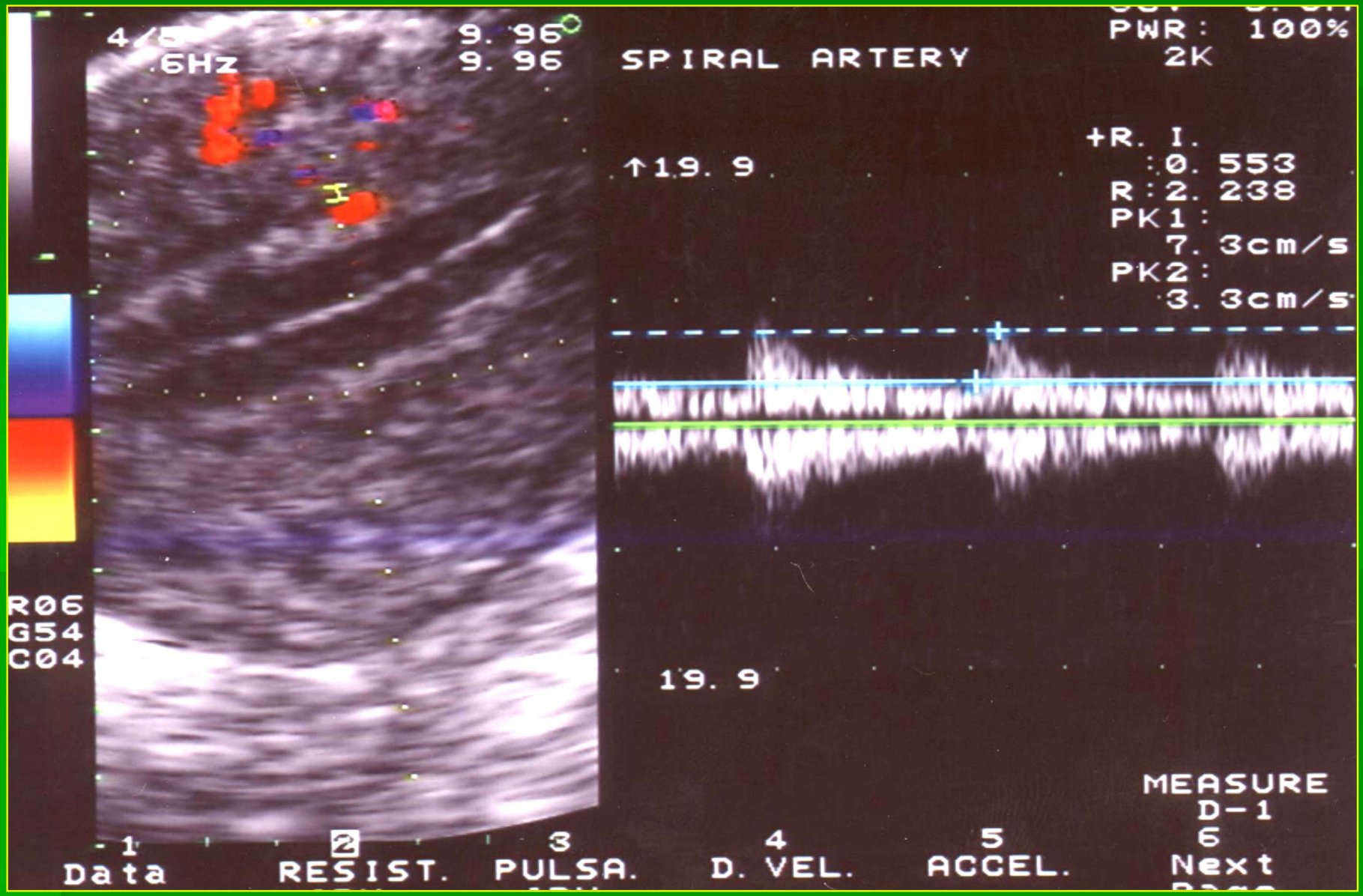
| | |
|---|---|
| Thickness | 7–14 mm |
| Progesterone | 8–32 nmol / l |

# SECRETION PHASE
# THICKNESS 7 - 16 mm

- homogen and hyperechogenic echo as result of mucin and glycogen in tortuotic endometrial glands



# TRIPPLE LINE ENDOMETRIUM



# Blastocyst

5 days post conception

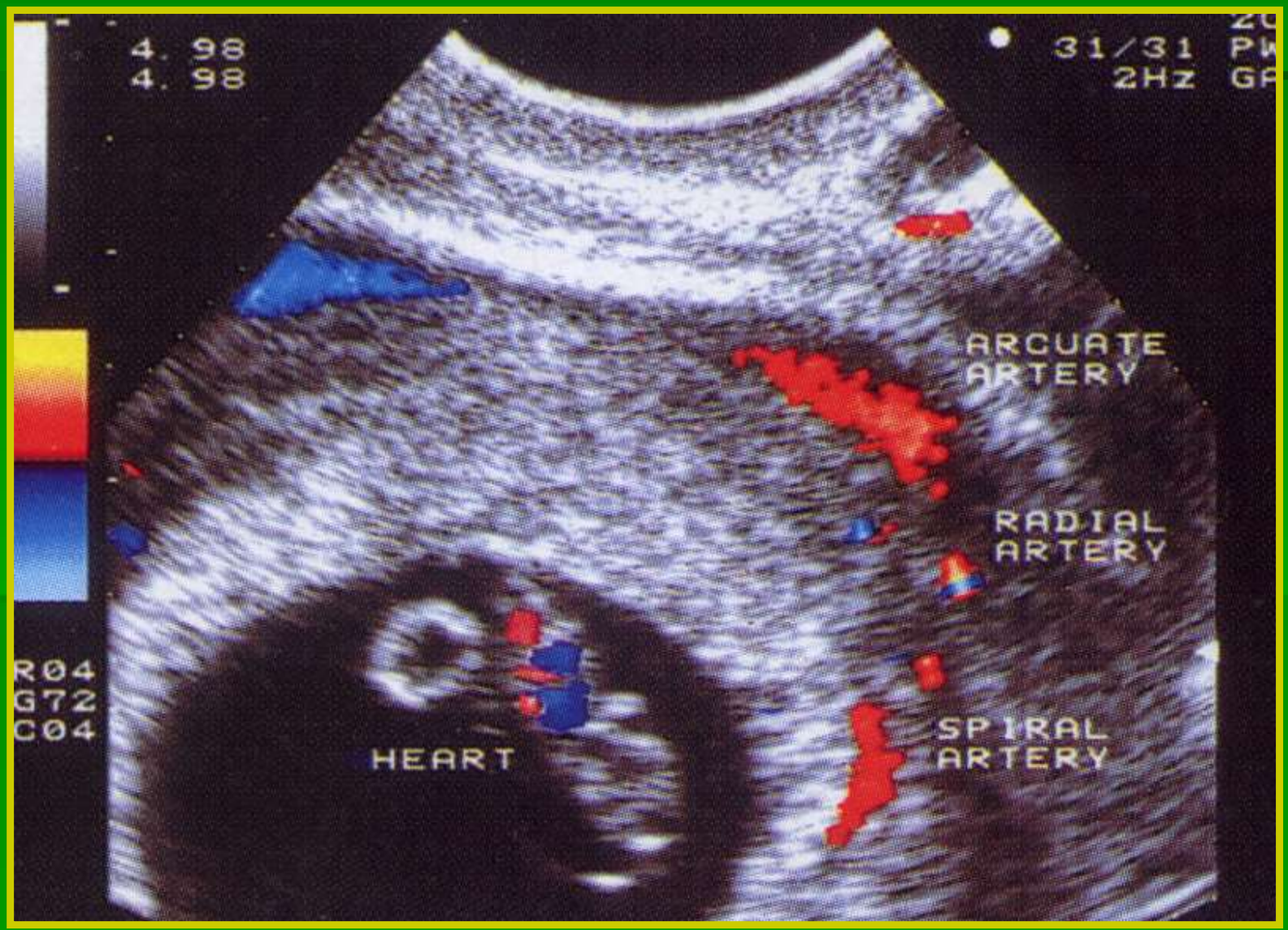
# Second week of Development bilaminar Germ Disk (not visible by ultrasound)

- The trophoblast differentiates into an inner cell mass (the cytotrophoblast) and an outer cell mass (the syncytiotrophoblast), which erodes the endometrium.
- Lacunar network is formed by the end of the second week and a primitive utroplacental circulation begins.

# Third week of Development trilaminar germ disk (not visible by ultrasound)

- The most characteristic event is gastrulation.
- By the end of the third week three basic germ layers consisting of ectoderm, mesoderm, and endoderm are established.
- Tissue and organ differentiation has begun.

# Uterine perfusion in early pregnancy



# Third to Eighth Week of Development
# The Embryonic Period

- This is the period of organogenesis.
- Each of the three germ layers (ectoderm, mesoderm and endoderm) give rise to its own tissues and organ systems.
- Major features of body form are established.

# Gestational Sac at 4 wks

# Gestational Sac at 5 wks
# 12-13 mm

# Establishment of intervillous circulation

- Lacunar formation – 10$^{th}$ to 13$^{th}$ days after conception
- Filled with blood on day 15$^{th}$
- Tertiary Villi formation on day 20$^{th}$

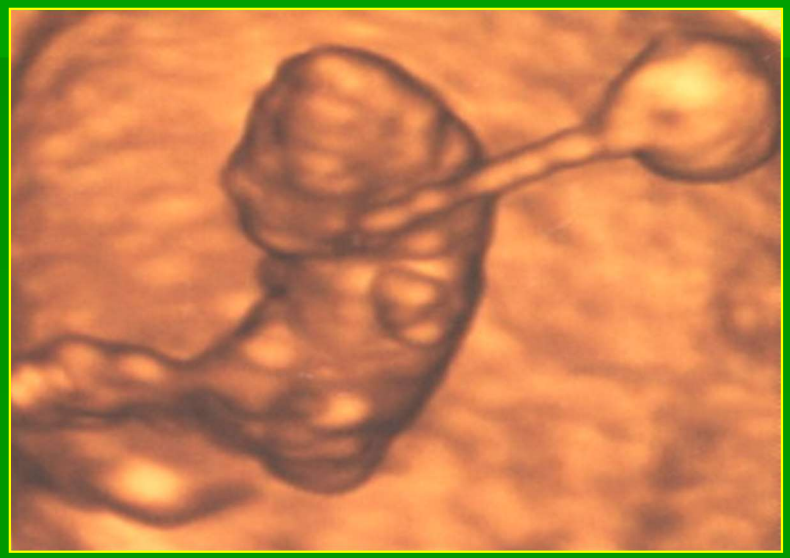
*Villous capillaries become connected with the embryonic heart tube*

# THE ROLE OF YOLK SAC

- TRANSFER OF NUTRIENTS IN THE 3rd AND 4th WEEK OF GESTATION
- HAEMATOPOESIS IN THE 5TH WEEK
- THE INITIAL SITE OF PRODUCTION OF AFP, PREALBUMIN, ALBUMIN AND TRANSFERIN
- ALL FUNCTIONS ARE COMPLETED

BY 8 WEEKS OF GESTATION

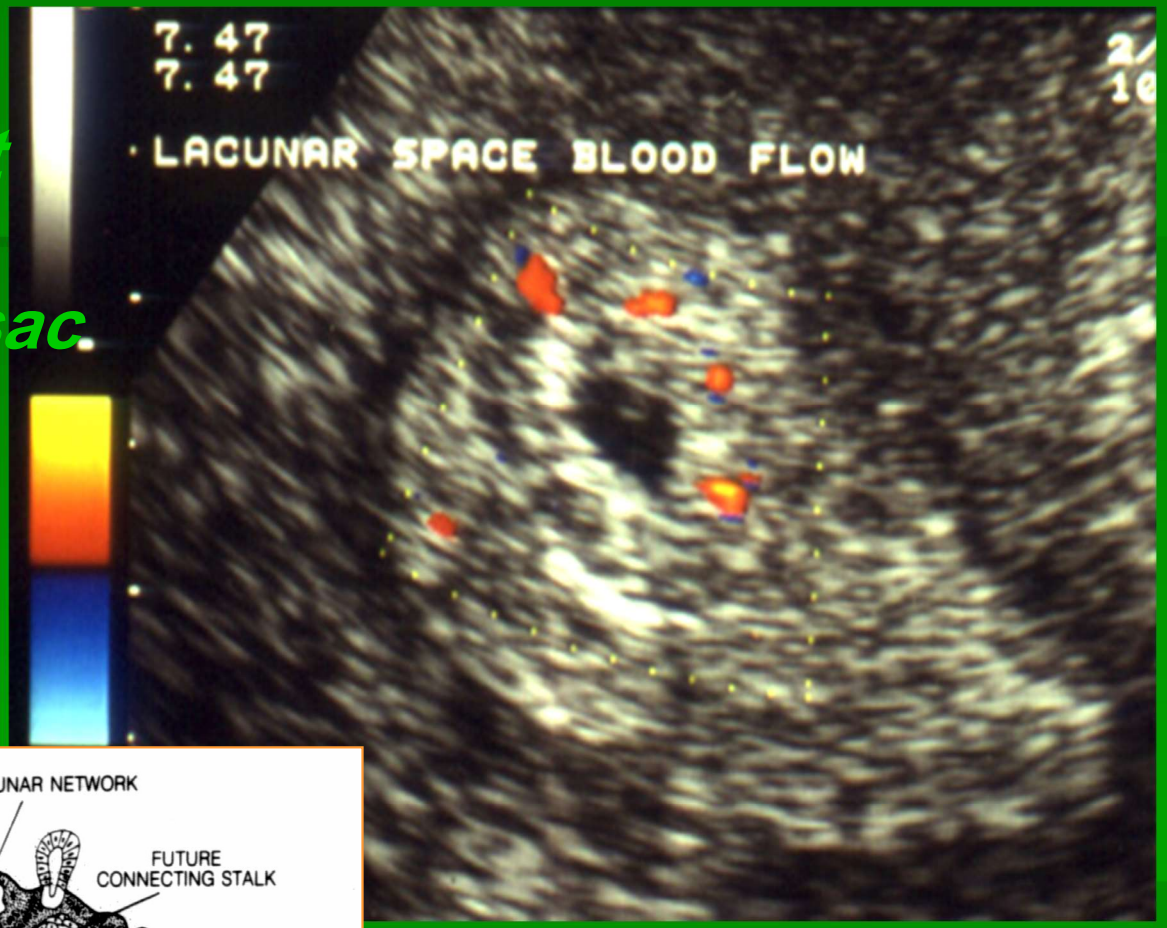
GESTATIONAL SAC DIAMETER › 8 mm

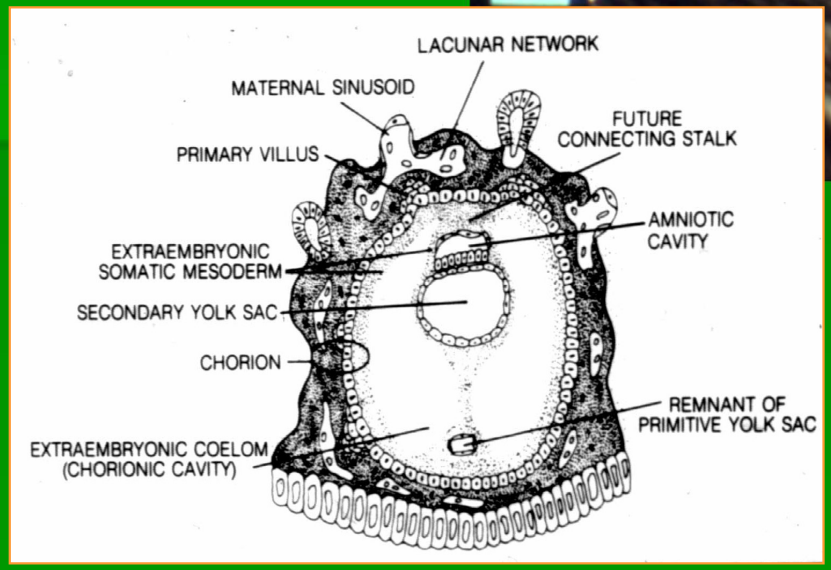


# 5-6 weeks:

- Early trophoblast
- Lacunar flow
- Secondary yolk sac

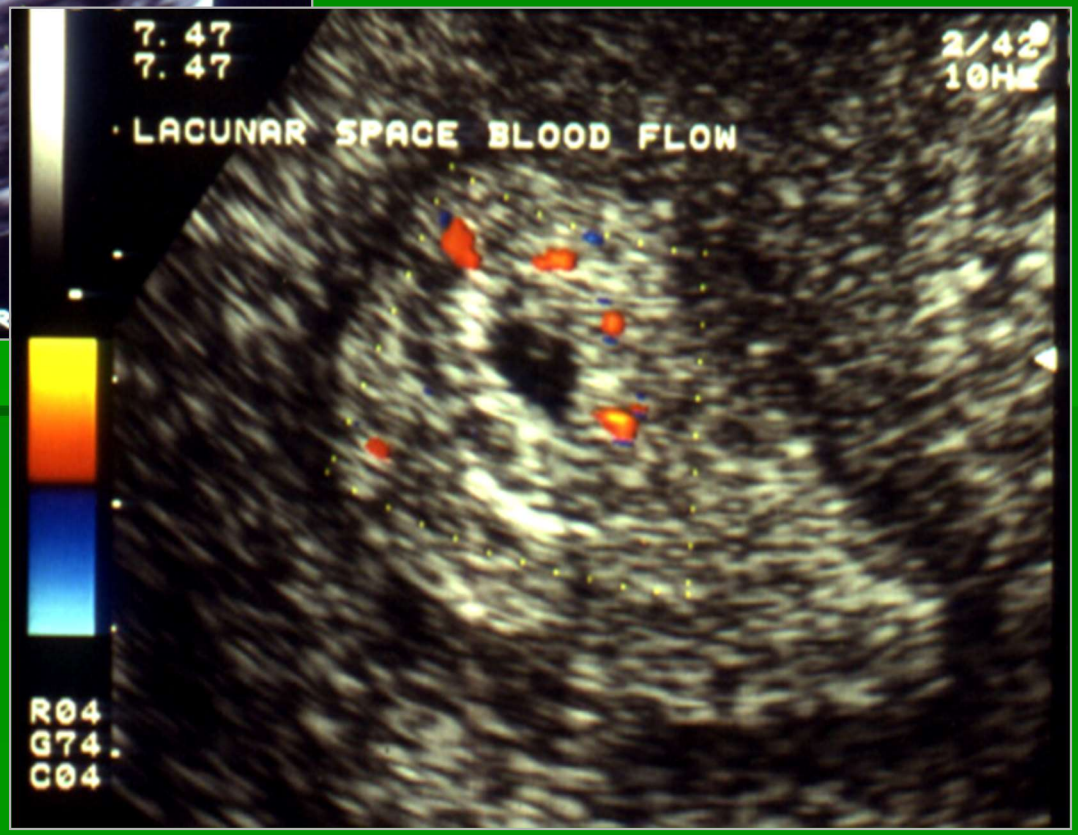
the first visible structures within gestational sac



# INTERVILOUS SPACE ( IVS )


5 - 6 w.g.a.



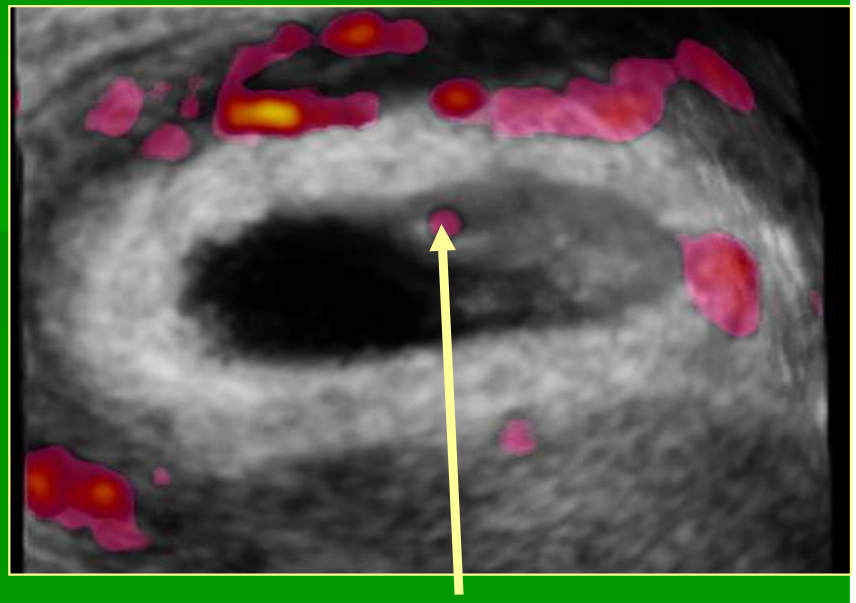
# Embryo at 6 wks

The embryo is 3-4 mm.

G.S is 14-15 mm

Heart activity visualized

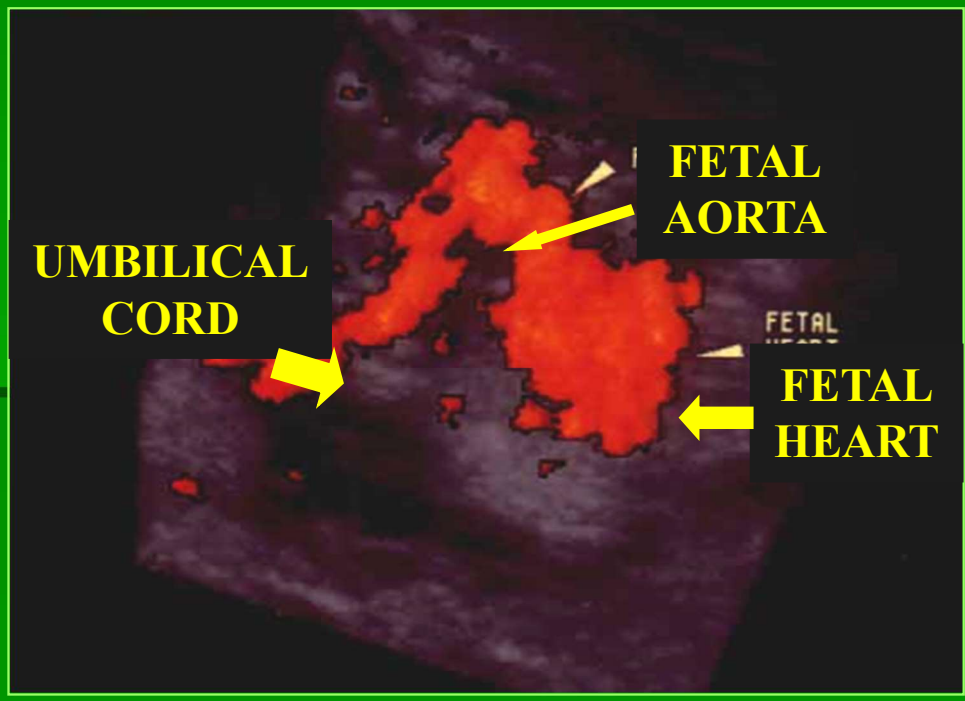
# 6 WEEKS

ONSET OF HEART ACTIVITY

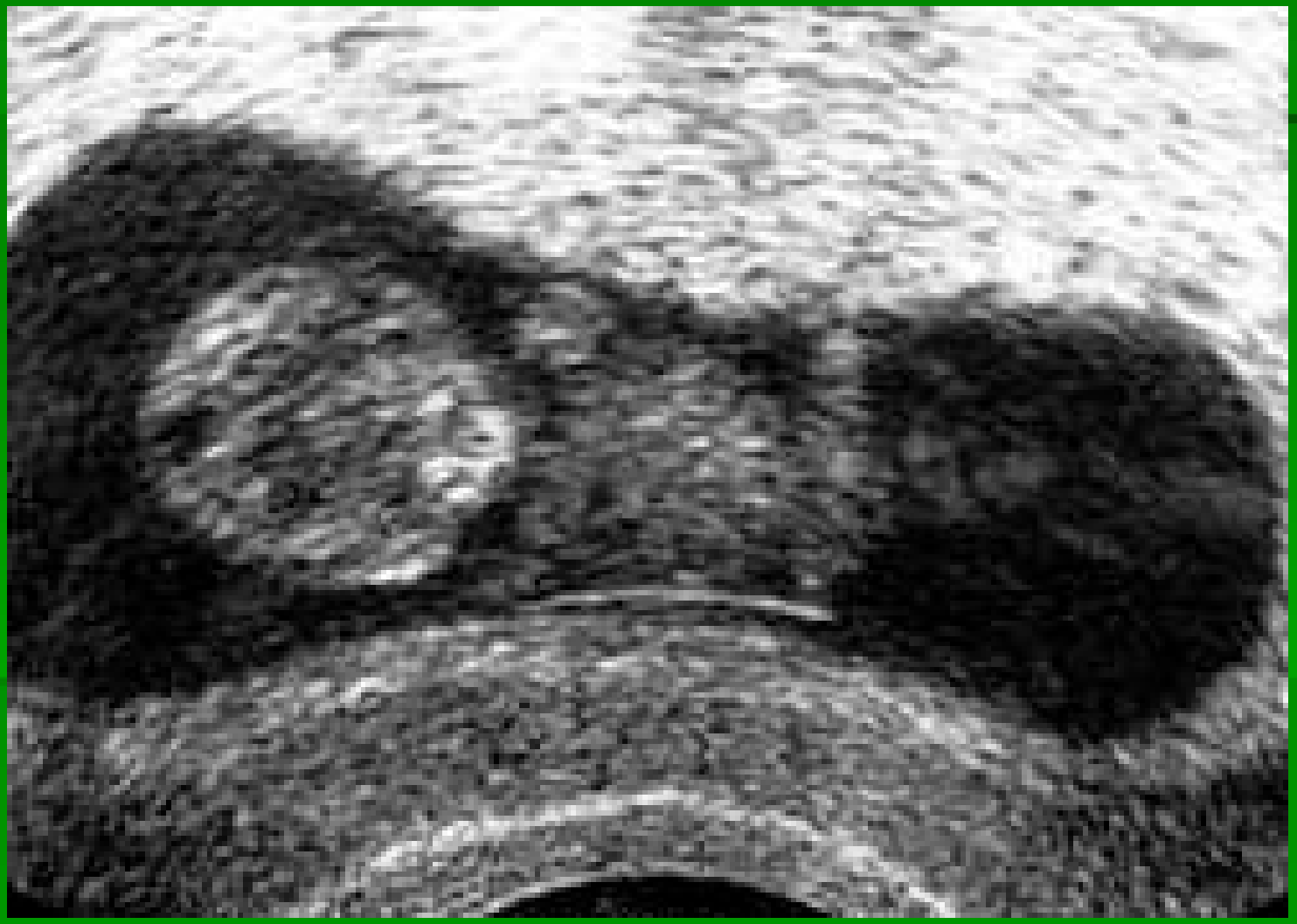
# 7 WEEKS


**GROSS BODY MOVEMENTS**




THE HEAD IS MORE PROMINENT DUE TO THE DEVELOPING RHOMBENCEPHALON. NO EVIDENCE OF CEREBRAL CIRCULATION.

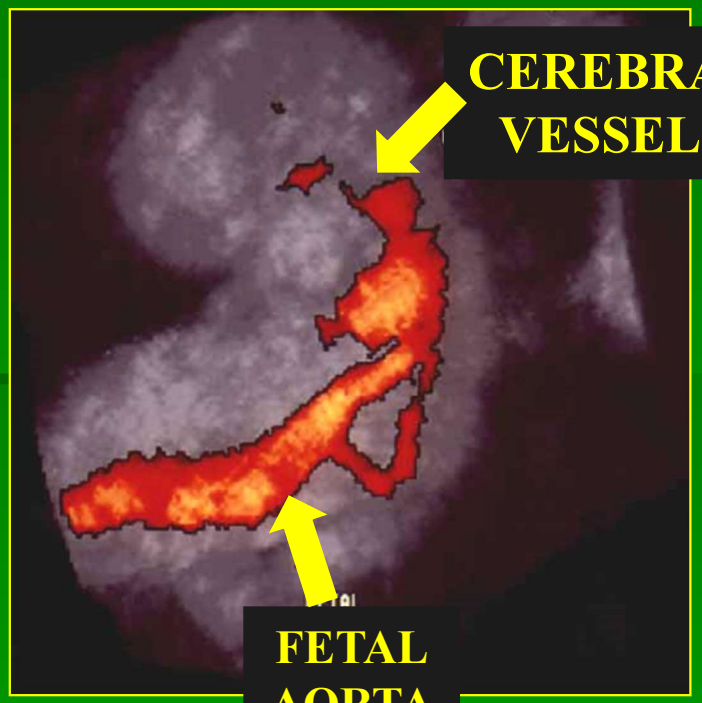
# Embryo at 7 wks

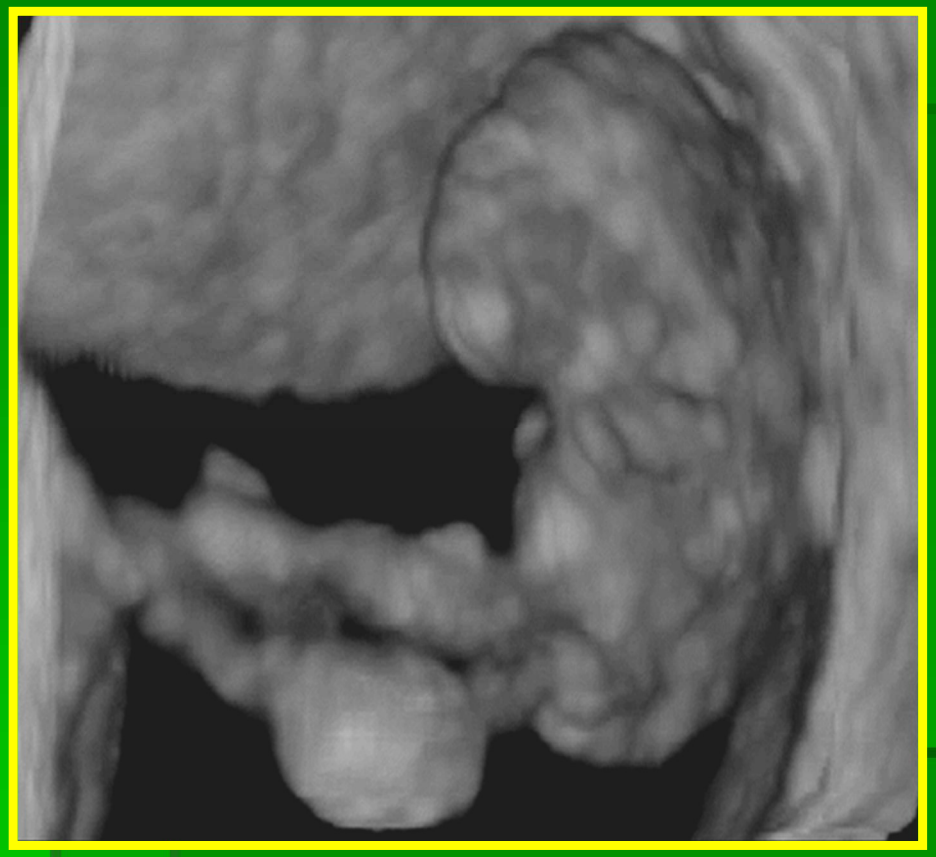


Chorionic cavity 19-20 mm  Embryo 5-6 mm

Cerebral circulation started

# 8 WKS



## GROSS BODY MOVEMENTS

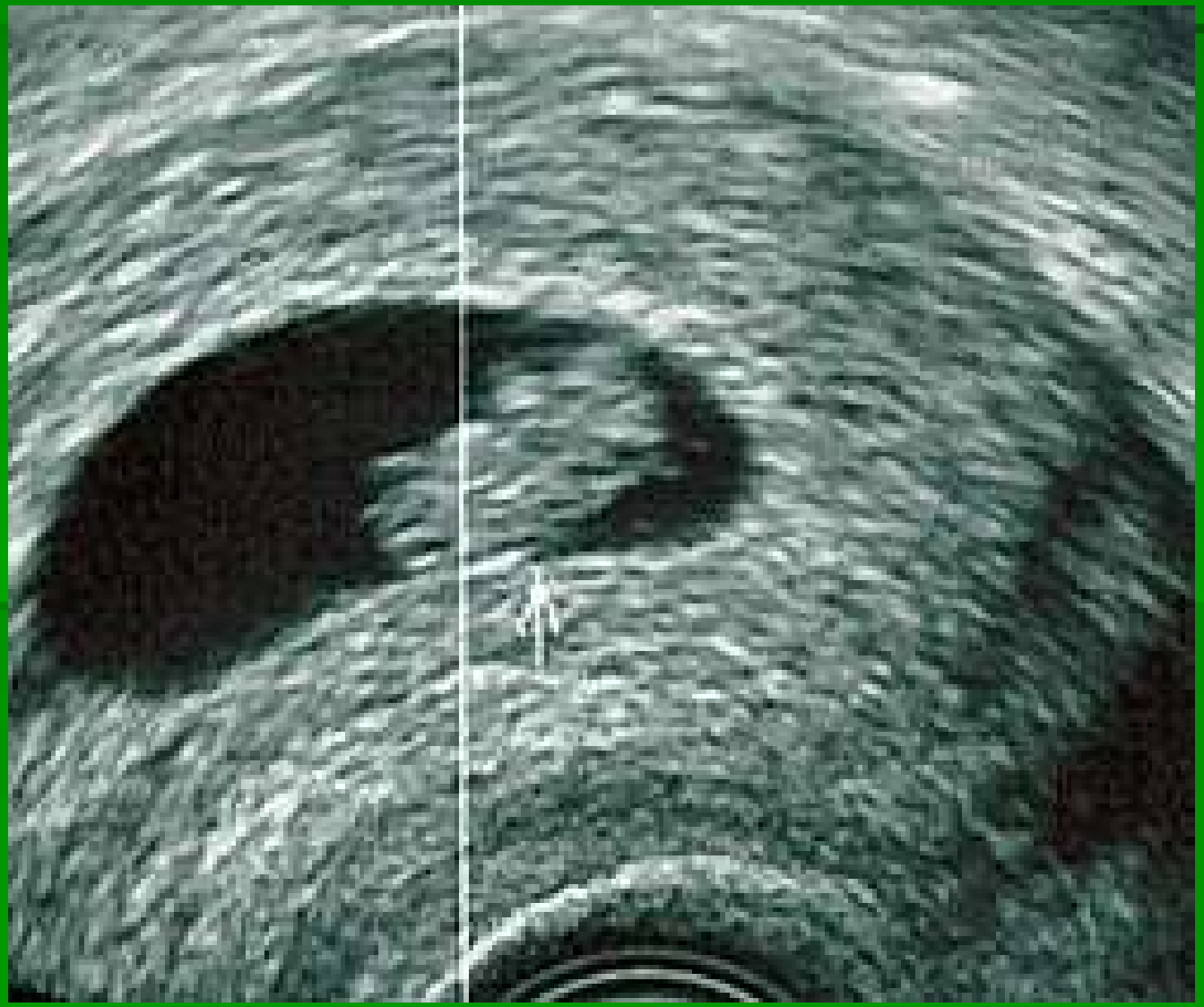
**ARMS AND LEGS MOVEMENTS**

# Embryo at 8 wks

Amniotic Cavity
17-19 mm.

Embryo size is
16-18 mm.

Choroinic cavity
30-32 mm.

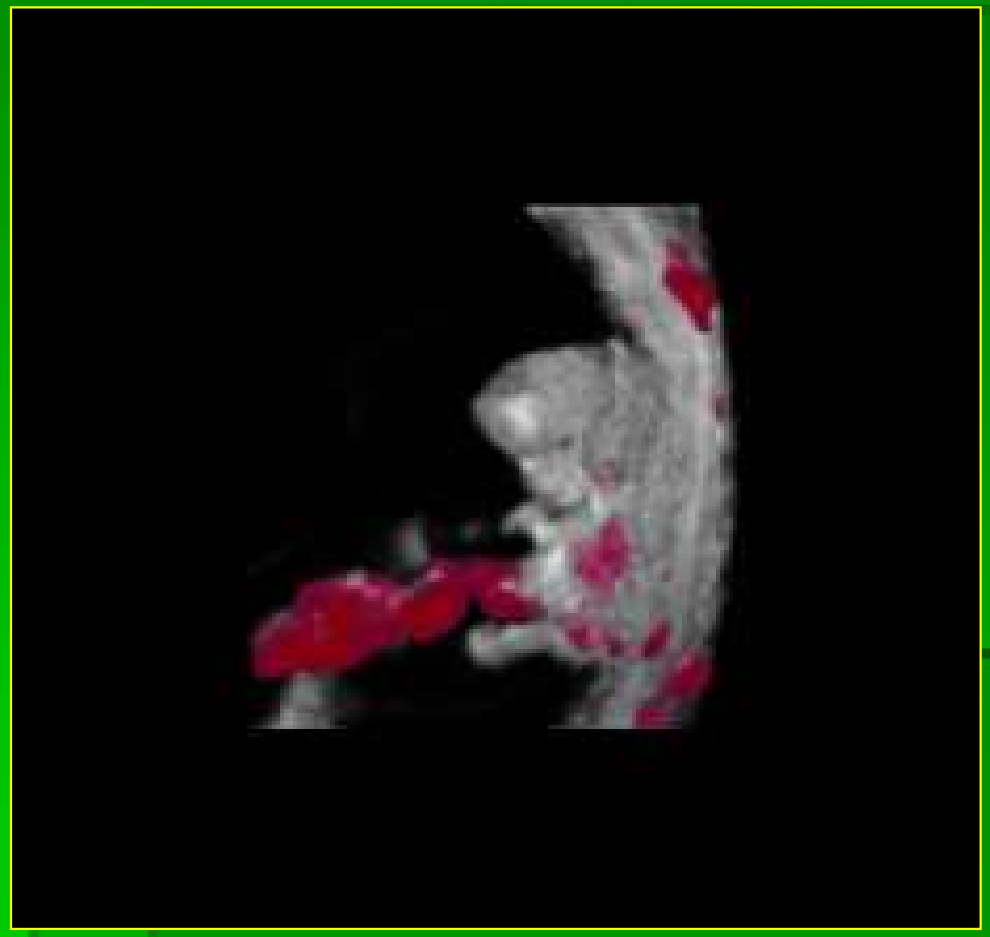


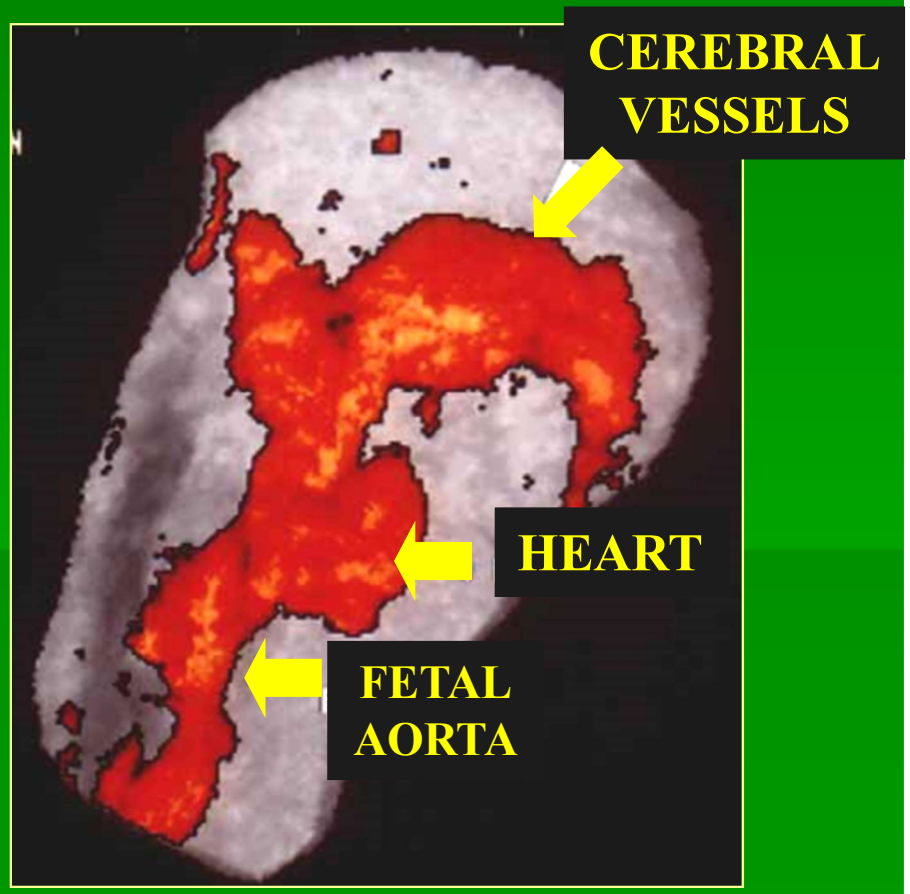
# Third month to birth the Fetus and Placenta

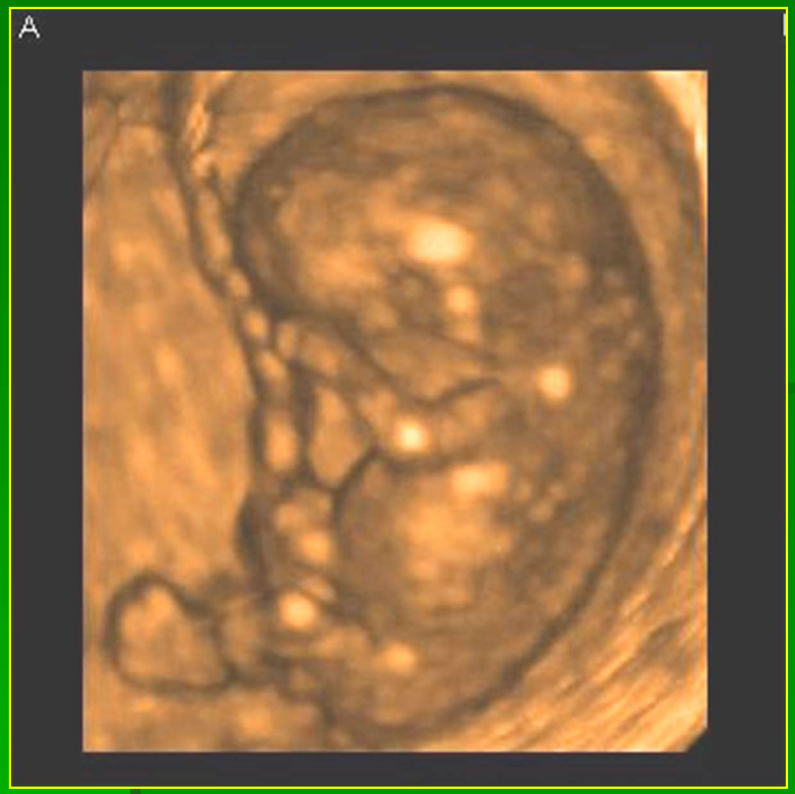
- The fetal period extends from the ninth week of gestation until birth and it is characterized by rapid growth of the body and maturation of organ systems.

Cerebral circulation
is established

# 9 WEEKS








# 9 WEEKS

**GROSS BODY MOVEMENTS**

STARTLE

STRECTHING

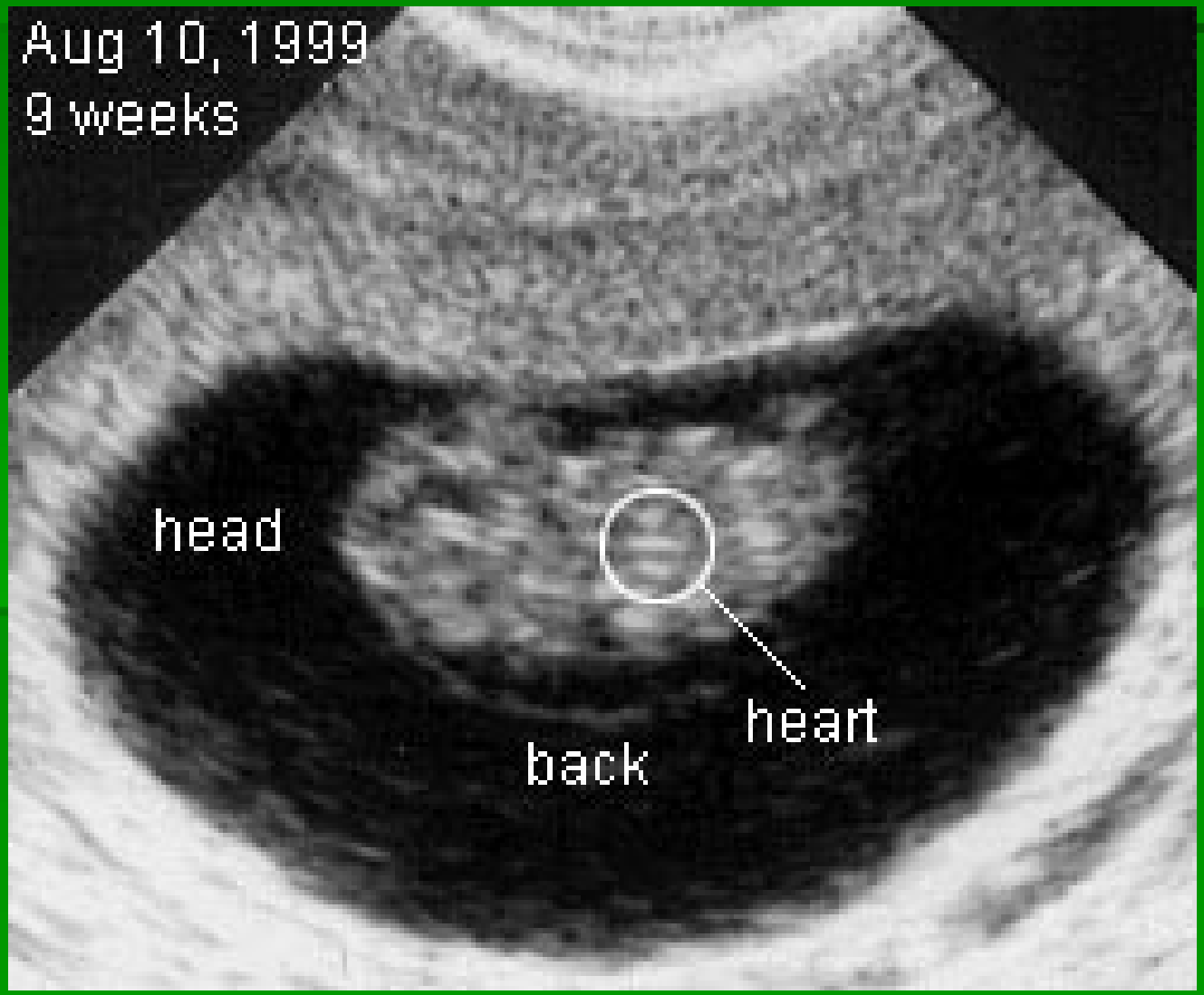
**ARMS AND LEGS MOVEMENTS**

HEAD ROTATION

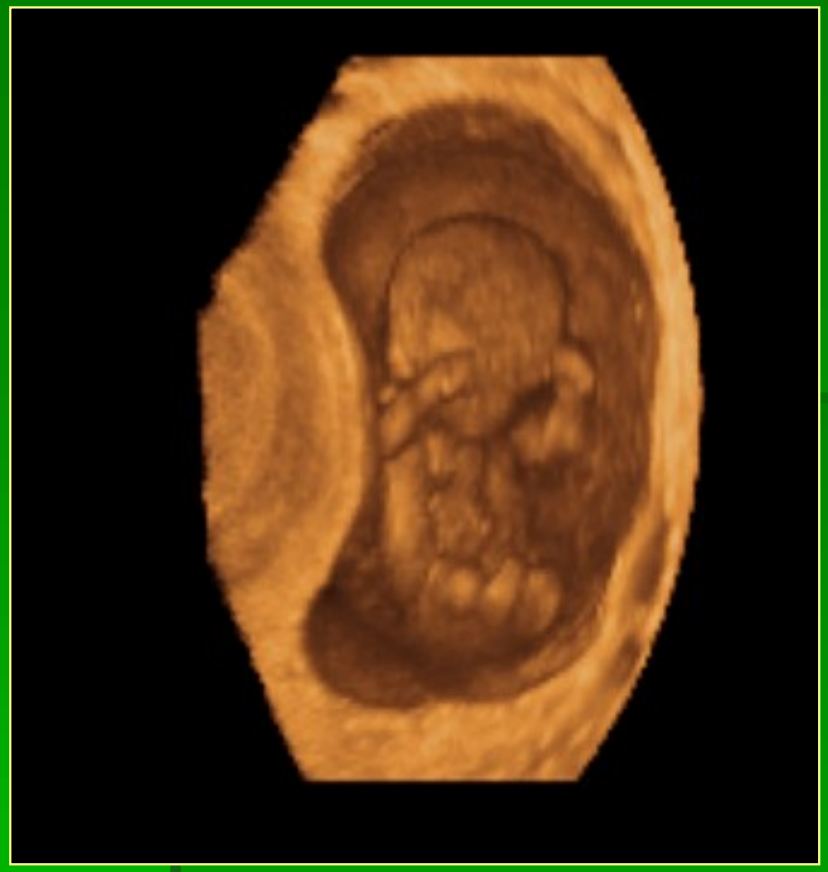
HAND MOVEMENTS

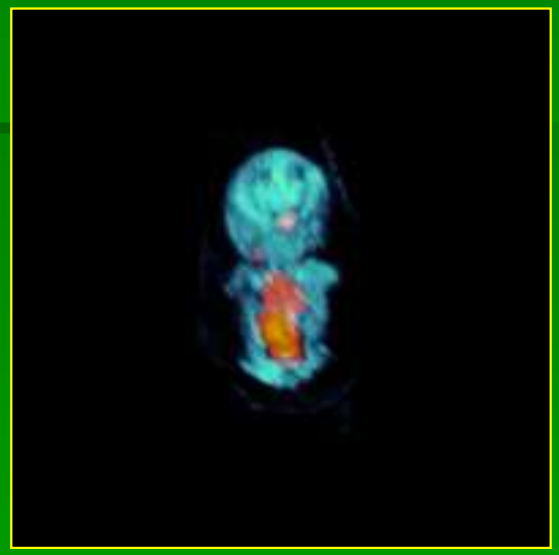
# Fetus at 9 wks with clear amniotic membrane

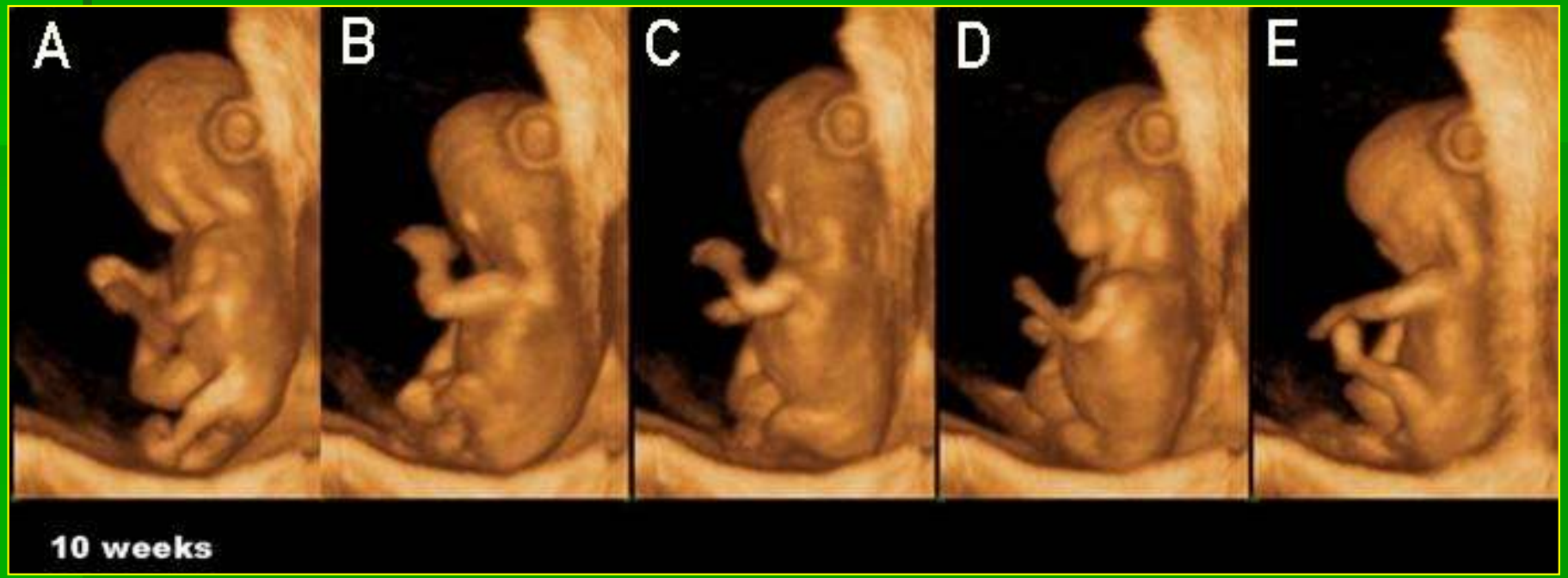
Embryo is 24-31 mm



# 10 weeks







# Fetus at 10 wks

Beginning of Ossification

Falx cerebri appears

Choroid plexus occupy the ventricles

Abdomen shows physiological omphalocele

# 3D Fetus at 10 wks

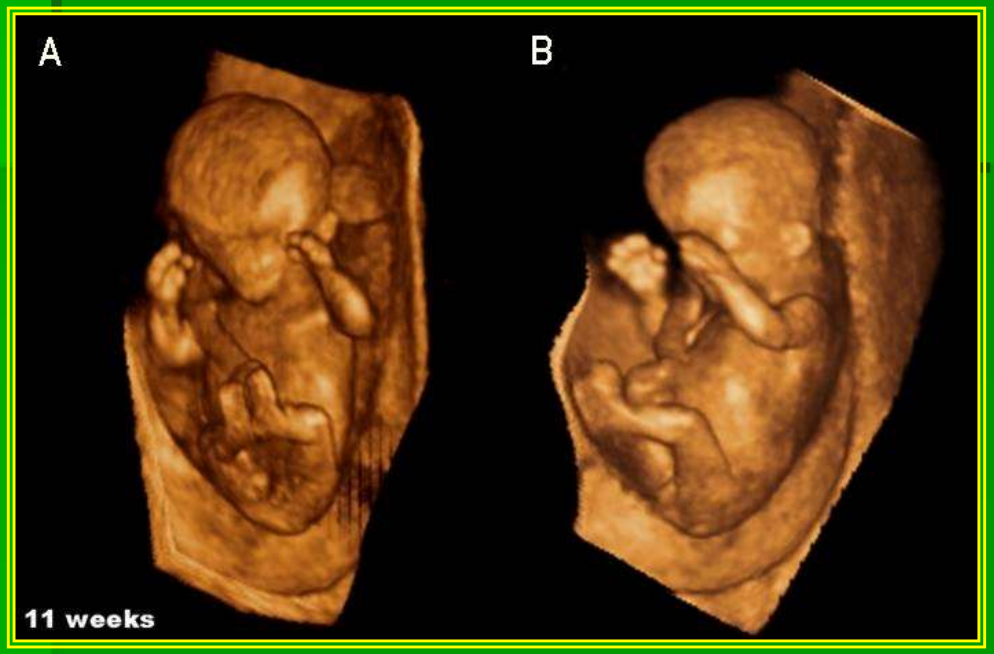
ALL THREE SEGMENTS OF THE UPPER AND LOWER EXTREMITIES ARE VISIBLE

# Fetus at 10 wks showing facial detail

The neck is visualized which in a sagital section presents the nuckal area – a double hyper echogenic outline – septated by a millimetric hypo echogenic band corresponding to subcut. tissue.

# 11 WEEKS

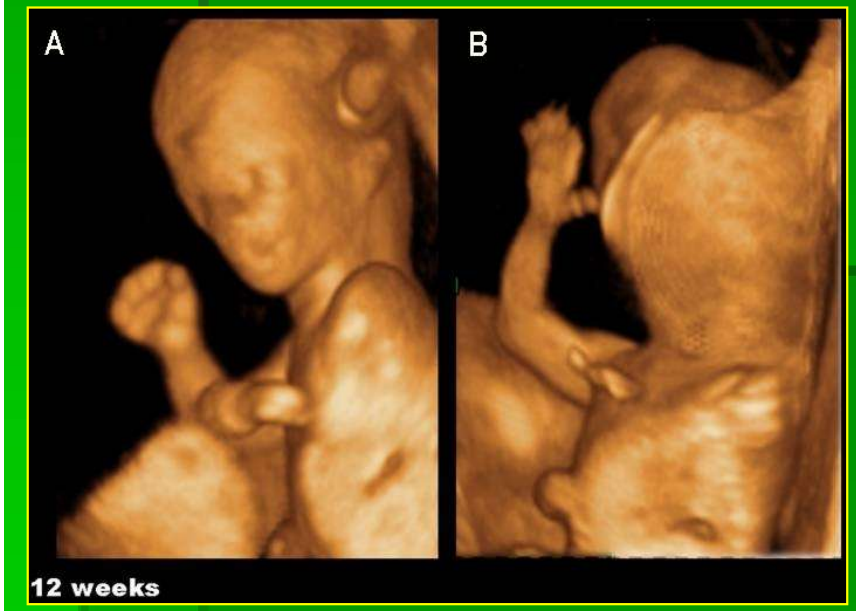
- GENERAL MOVEMENTS
- STARTLE
- STRETCHING
- ISOLATED ARM MOVEMENTS
- ISOLATED LEG MOVEMENTS
- HEAD MOVEMENTS AND ROTATIONS
- HAND TO FACE CONTACT



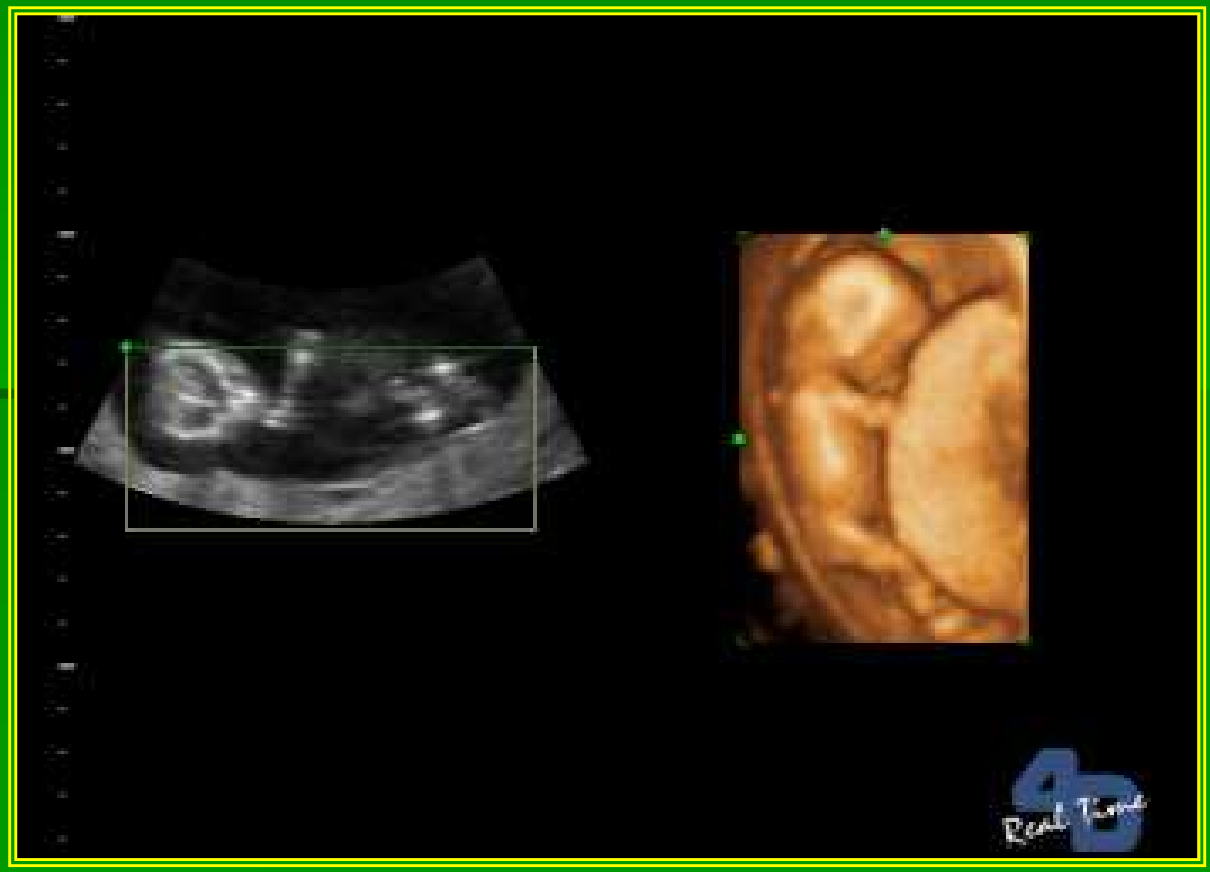


# 12 weeks

Head rotation
Limb movements
General movements




Clench and unclench fists



# Fetus at 12 wks – arm/fingers visible

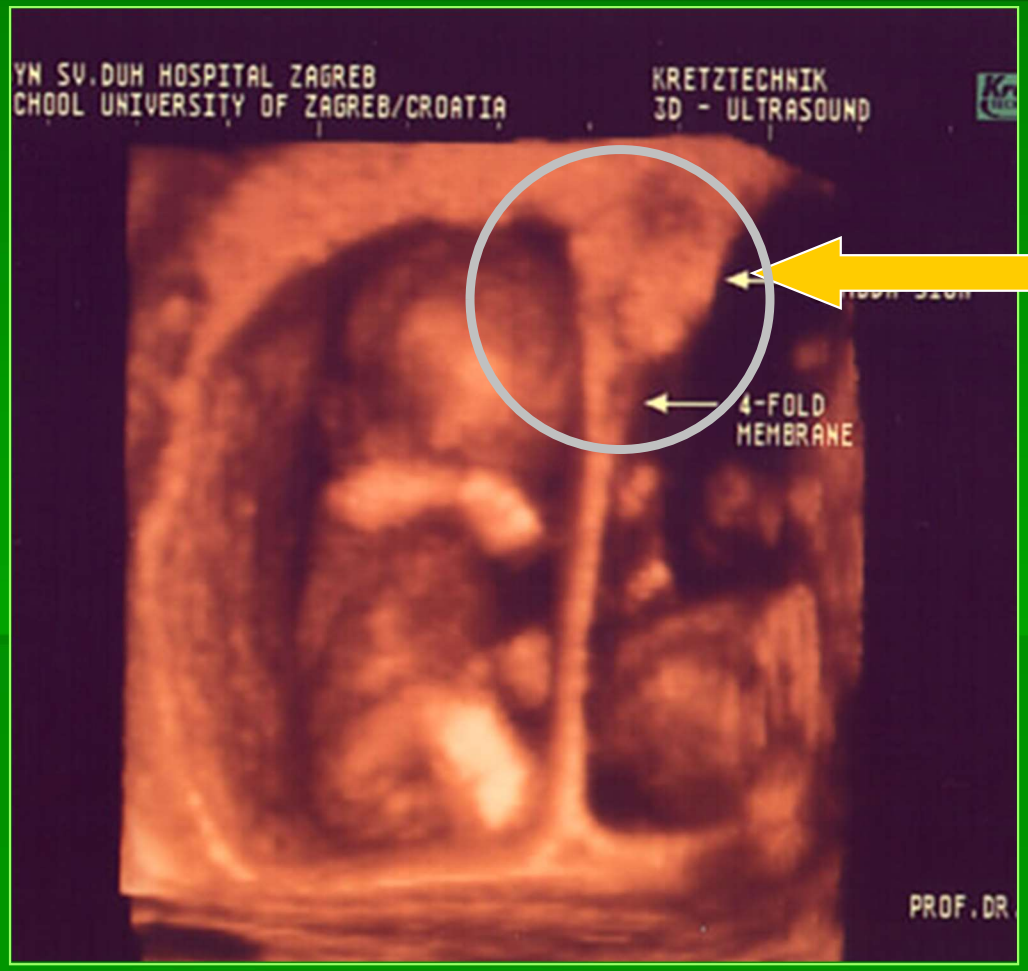
The fetus is much more explorable

# 13 weeks

- GENERAL MOVEMENTS
- STARTLE
- STRETCHING
- ISOLATED ARM MOVEMENTS
- ISOLATED LEG MOVEMENTS
- HEAD MOVEMENTS AND ROTATIONS
- HAND-FACE CONTACTS

# MONOZIGOTIC

# BICHORIONIC BIAMNIOTIC TWINS




LAMBDA SIGN

3D

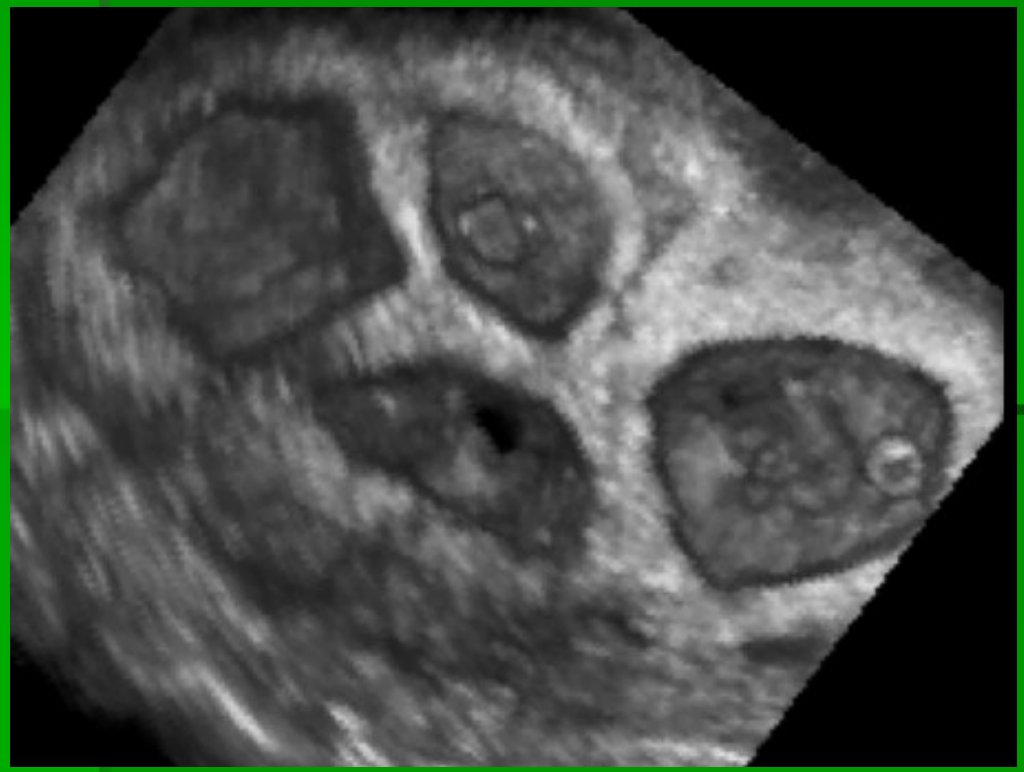
# 3D TRIPLETS

FRONT

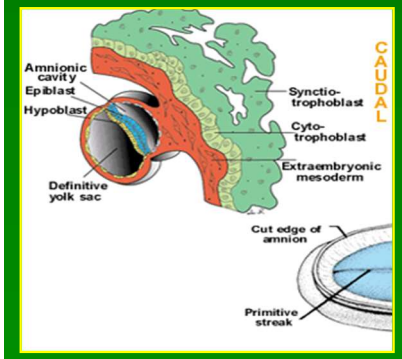
BACK

# 3D

## QUADRIPLET

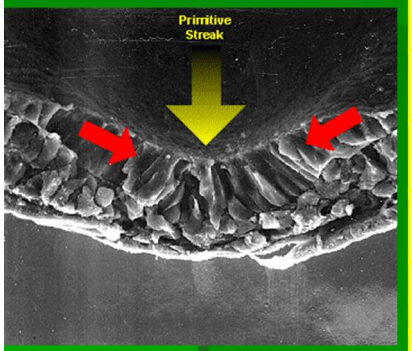


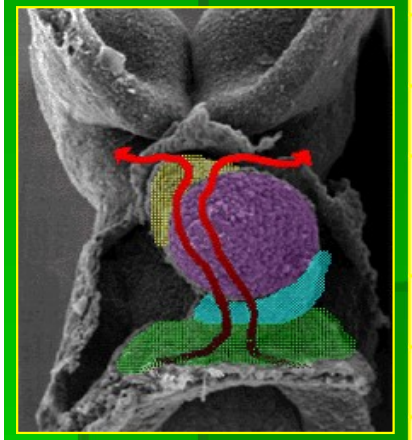
## QUINTUPLET




# 2D SONOEMBRYOLOGY

## GESTATIONAL WEEKS



| STRUCTURES | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|
| Gestational sac | | | | | | | | | | |
| Yolk sac | | | | | | | | | | |
| Embryo | | | | | | | | | | |
| Heart Activity | | | | | | | | | | |
| Brain Vesicle | | | | | | | | | | |
| Neural tube | | | | | | | | | | |
| Fourth Ventricle | | | | | | | | | | |
| Limb | | | | | | | | | | |
| Phisiological Umbilical Hernia | | | | | | | | | | |
| Lateral Ventricle | | | | | | | | | | |
| Choroid Plexus | | | | | | | | | | |
| Falx Cerebri | | | | | | | | | | |
| Neck | | | | | | | | | | |
| Stomack | | | | | | | | | | |
| Cerebelum | | | | | | | | | | |
| Kidney | | | | | | | | | | |

# THANK YOU