CERPO
Centro de Referencia Perinatal Oriente
Facultad de Medicina, Universidad de Chile

Seminario Nº5
Ecografía primer trimestre (hasta 10+6 semanas)

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Introducción

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- Ecografía 1er trimestre: antes de las 14 semanas.
  - Hasta 10 semanas es período embrionario.
  - Luego es período fetal postembrionario temprano.

- Considerado un examen estándar, mas no de rutina sólo para confirmar diagnóstico de embarazo si asintomática.

- Una ecografía precoz no excluye la recomendación de una ecografía de screening entre las 11+0 y 13+6 semanas.

Introducción

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- Realizar una búsqueda y registro sistemático de hallazgos:
  - Saco gestacional, Saco vitelino, Embrión, Longitud céfalo-nalgas, Latidos cardiofetales, Corionicidad si múltiple, etc.

- El conocimiento del momento en el que aparecen normalmente las estructuras embrionarias es fundamental.

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Box 2. Indications for First-Trimester Ultrasonography ⇦

Indications for first-trimester ultrasonography include, but are not limited to the following:

- To confirm the presence of an intrauterine pregnancy
- To evaluate a suspected ectopic pregnancy
- To evaluate vaginal bleeding
- To evaluate pelvic pain
- To estimate gestational age
- To diagnose or evaluate multiple gestations
- To confirm cardiac activity
- As adjunct to chorionic villus sampling, embryo transfer, or localization and removal of an intrauterine device
- To assess for certain fetal anomalies, such as anencephaly, in patients at high risk
- To evaluate maternal pelvic or adnexal masses or uterine abnormalities
- To screen for fetal aneuploidy
- To evaluate suspected hydatidiform mole

Data from the American College of Radiology. ACR-ACOG-AIUM-SRU Practice parameter for the performance of obstetrical ultrasound. ACR, Diagnostic Radiology: Ultrasonography Practice Parameters and Technical Standards, 2013. Amended 2014.

Introducción

- Vía transvaginal:
  - Distancia transductor – target es menor → Mínima atenuación de ondas sonoras → Mejor resolución de detalles.
  - Imágenes visibles 1 semana antes versus vía transabdominal.
  - Hasta las 10-12 semanas → útero grávido intrapélvico.

- Segura → "Principio ALARA" (As Low As Reasonably Achievable)
  - Mínimo tiempo y potencia razonablemente posible.

Introducción: Objetivos

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1. Confirmación de embarazo
2. Viabilidad del embarazo
3. Determinación de edad gestacional
4. Número de fetos / Corionicidad

1. Confirmación de embarazo: Saco Gestacional

1. Confirmación de embarazo: Saco Gestacional

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- **Primer hallazgo ecográfico de gestación intrauterina**.
  - Entre las 4+1 a 4+3 semanas.
  - 2-3 mm.
  - b-HCG 1500-3000 UI/L.
  - Si TA: 7-10 mm, 5+0 semanas.
  - Crecimiento 1 mm/día.
- **Diámetro sacular medio**: promedio entre 3 medidas ortogonales: anteroposterior, longitudinal y transverso.

1. Confirmación de embarazo: Saco Gestacional

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Localización intradecidual

- En el espesor de la decidua engrosada.
- Sin desplazar inicialmente los ecos de la cavidad central.

Anillo hiperecogénico

- Desarrollo de vellosidades coriónicas en el tejido decidual adyacente, rodea la colección anecogénica central (cavidad coriónica).

Signo del doble halo

- Son dos líneas concéntricas ecogénicas que rodean una porción del SG: corion liso y decidua capsular (línea interna), y la decidua parietal o vera (línea externa).

1. Confirmación de embarazo: Saco Gestacional

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- **Vasos subcoriónicos** al Doppler en unión de miometrio y tejidos ecogénicos coriodeciduales, flujo pulsátil, de baja resistencia.

- **Diferenciar de Pseudosaco:**
  - Líquido intracavitario por secreción mucosa o sangrado.
  - Localización central en cavidad endometrial.
  - Sin flujo peritrofoblástico al Doppler.
  - Se presenta en un 20% de Embarazo ectópico.

1. Confirmación de embarazo: Saco Vitelino

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1. Confirmación de embarazo: Saco Vitelino

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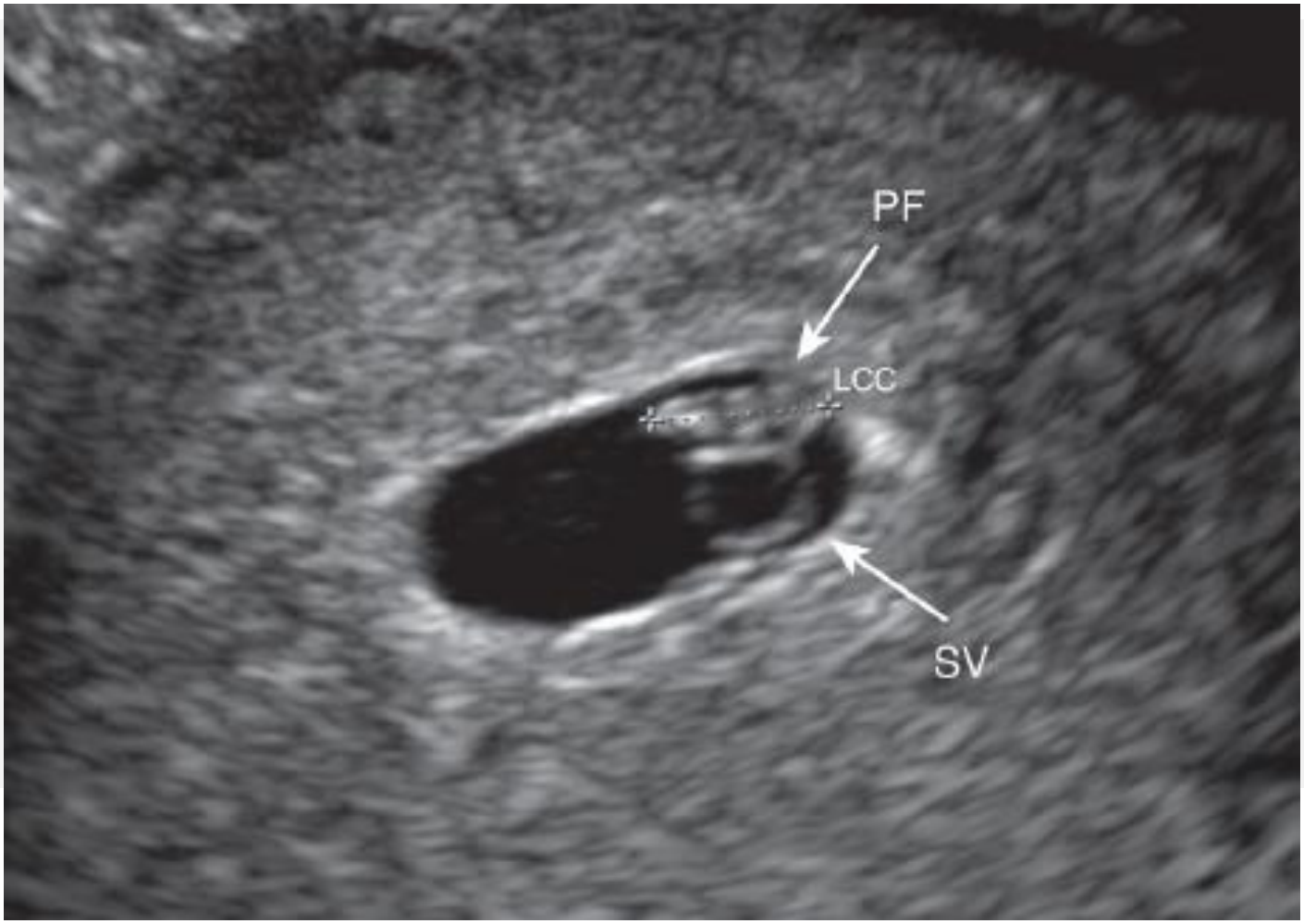
- **Primera estructura embrionaria** que se identifica dentro del SG, antes que aparezca el embrión.

- Su presencia **confirma que el embarazo es intrauterino.**

- Se visualiza como una burbuja anecogénica de pared fina.
  - Entre las 5+0 y 5+5 semanas
  - 3-4 mm, aprox cuando SG 10 mm.
  - Si TA: 7+0 semanas, cuando SG 20 mm.
  - Intracorial, extramniótico.

1. Confirmación de embarazo: Embrión



1. Confirmación de embarazo: Embrión

- Su presencia **confirma que el embarazo es intrauterino.**

- Engrosamiento focal en la periferia del SV:
  - Desde 5+3 semanas.
  - Visible desde 2-3 mm.
  - Desde que SG aprox 15 mm.
  - **Siempre con SG ≥ 25 mm.**

- **LCF (+)** desde EG 5+3 semanas. **Siempre con embrión ≥ 7 mm.**

- "EG días = LCN mm + 42" (con LCN hasta 25 mm)

1. Confirmación de embarazo: Hitos ecográficos

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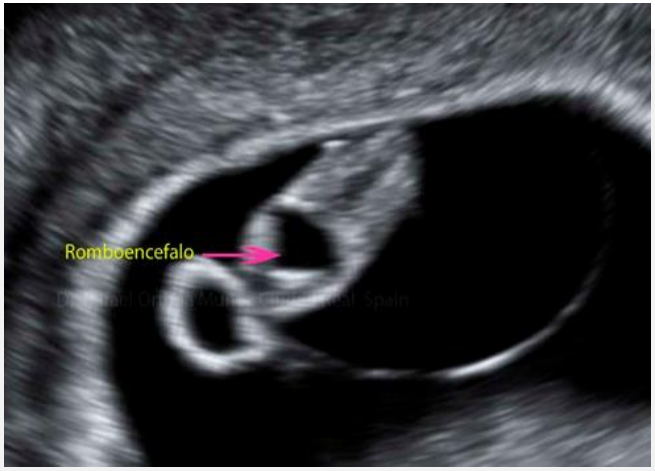
Stage (Weeks+days)	Development event
$4^{+3} - 4^{+6}$	A small gestation sac (2–5 mm) is seen within the endometrium. The sac is spherical, regular in outline and eccentrically situated towards the fundus. It is implanted just below the surface of the endometrium (midline echo) and is surrounded by echogenic trophoblast
$5^{+0} - 5^{+6}$	Yolk sac becomes visible within the chorionic cavity. This should be seen in all pregnancies with a mean gestational sac diameter of >12 mm. The embryonic pole becomes visible at the end of this week and it measures 2–3 mm in length. Heart action is also detectable
$6^{+0} - 6^{+6}$	The embryo changes from being a straight line at the top of the yolk sac to being kidney bean-shaped, with the yolk sac separated from the embryo by the vitelline duct. The crown–rump length measures 4–8 mm. If the heart rate is not detectable, the diagnosis of missed miscarriage is almost certain
$7^{+0} - 7^{+6}$	The crown–rump length measures 9–14 mm. The rhombencephalon becomes distinguishable as a diamond shaped cavity, enabling distinction of cephalad and caudal. The spine is seen as double echogenic parallel lines. The amniotic membrane becomes visible defining the amniotic cavity from the chorionic cavity. The umbilical cord can also be seen
$8^{+0} - 8^{+6}$	Crown–rump length 15–22 mm. Forebrain, midbrain, hindbrain and skull are distinguishable. Limb buds are also visible. Midgut hernia is present. The amniotic cavity expands and the umbilical cord and vitelline duct lengthens
$9^{+0} - 9^{+6}$	Crown–rump length 23–32 mm. The limbs lengthen and hands and feet are seen. Embryonic heart rate peaks at 170–180 beats/minute

1. Confirmación de embarazo: Hitos ecográficos (7+0 – 7+6 sem)



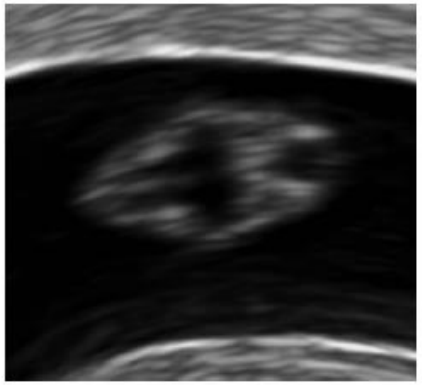


FIGURE 13.8 Frontal section through the head of an 11-mm embryo with clearly defined mesencephalic and rombencephalic cavities

$7^{+0} - 7^{+6}$	The crown–rump length measures 9–14 mm. The rhombencephalon becomes distinguishable as a diamond shaped cavity, enabling distinction of cephalad and caudal. The spine is seen as double echogenic parallel lines. The amniotic membrane becomes visible defining the amniotic cavity from the chorionic cavity. The umbilical cord can also be seen

- Área quística en forma de rombo en polo cefálico correspondiente a **Romboencéfalo** (futuro 4to ventrículo). **Polo cefálico vs caudal.**
- **Membrana amniótica** visible, con saco y arteria vitelina extramniótica.

1. Confirmación de embarazo: Hitos ecográficos (8+0 – 8+6 sem)

- Se distinguen **cavidades cerebrales** (Prosencéfalo, Mesencéfalo, Romboencéfalo)
- **Plexos coroideos** como signo de bilateralidad.
- Se distinguen **yemas de extremidades**.
- **Hernia umbilical fisiológica.**

$8^{+0} – 8^{+6}$	Crown–rump length 15–22 mm. Forebrain, midbrain, hindbrain and skull are distinguishable. Limb buds are also visible. Midgut hernia is present. The amniotic cavity expands and the umbilical cord and vitelline duct lengthens

1. Confirmación de embarazo: Hitos ecográficos (9+0 – 9+6 sem)

- **Aumenta movimiento embrionario.**
- **LCF alcanza máximo: 175 lat/min.**
- Crecimiento de hemisferios.
- Ventrículos laterales.
- Columna distinguible como 2 líneas paralelas ecogénicas.
- Se identifican dedos y ortejos.
- **Máximo tamaño de hernia umbilical fisiológica.**

FIGURE 13.15 Section through a 9-week gestational sac demonstrating amniotic membrane separating coelomic and amniotic cavities. The embryonic limbs are fully developed and fingers and toes are clearly visible

FIGURE 13.16 Sagittal section through an embryo with a crown–rump length of 22 mm, demonstrating hemispheres, third ventricle, mesencephalon, fourth ventricle and choroid plexi

$9^{+0} – 9^{+6}$	Crown–rump length 23–32 mm. The limbs lengthen and hands and feet are seen. Embryonic heart rate peaks at 170–180 beats/minute

1. Confirmación de embarazo: Hitos ecográficos (10+0 – 10+6 sem)

- Posición neutra (previa tendencia a hiperflexión).
- **Características humanas clásicas distinguibles.**
- **Regresión de Hernia fisiológica.**

2. Viabilidad del embarazo

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Saco gestacional

Longitud céfalo-nalgas

Latidos cardiofetales

2. Viabilidad del embarazo

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The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

CURRENT CONCEPTS

Edward W. Campion, M.D., *Editor*

Diagnostic Criteria for Nonviable Pregnancy Early in the First Trimester

Peter M. Doubilet, M.D., Ph.D., Carol B. Benson, M.D., Tom Bourne, M.B., B.S., Ph.D., and Michael Blaivas, M.D., for the Society of Radiologists in Ultrasound Multispecialty Panel on Early First Trimester Diagnosis of Miscarriage and Exclusion of a Viable Intrauterine Pregnancy*

N Engl J Med 2013;369:1443-51.
DOI: 10.1056/NEJMra1302417

2. Viabilidad del embarazo

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Table 1. Terminology and Diagnostic Tests Used Early in the First Trimester of Pregnancy.

Terminology	Comments
Viable	A pregnancy is viable if it can potentially result in a liveborn baby.
Nonviable	A pregnancy is nonviable if it cannot possibly result in a liveborn baby. Ectopic pregnancies and failed intrauterine pregnancies are nonviable.
Intrauterine pregnancy of uncertain viability	A woman is considered to have an intrauterine pregnancy of uncertain viability if transvaginal ultrasonography shows an intrauterine gestational sac with no embryonic heartbeat (and no findings of definite pregnancy failure).*
Pregnancy of unknown location	A woman is considered to have a pregnancy of unknown location if she has a positive urine or serum pregnancy test and no intrauterine or ectopic pregnancy is seen on transvaginal ultrasonography.
Diagnostic tests	
Human chorionic gonadotropin (hCG)	Serum hCG concentration is measured with the use of the World Health Organization 3rd or 4th International Standard. A positive serum pregnancy test is defined by a serum hCG concentration above a positivity threshold (5 mIU/ml).
Pelvic ultrasonography†	Minimum quality criteria include transvaginal assessment of the uterus and adnexa and transabdominal evaluation for free intraperitoneal fluid and a mass high in the pelvis; oversight provided by an appropriately trained physician; scans performed by providers and interpreted by physicians, all of whom meet at least minimum training or certification standards for ultrasonography, including transvaginal ultrasonography; and scanning equipment permitting adequate visualization of structures early in the first trimester.

* In a woman with a positive urine or serum pregnancy test, an intrauterine fluid collection with rounded edges containing no yolk sac or embryo is most likely a gestational sac; it is certain to be a gestational sac if it contains a yolk sac or embryo.

† Transabdominal imaging without transvaginal scanning may be sufficient for diagnosing early pregnancy failure when an embryo whose crown–rump length is 15 mm or more has no visible cardiac activity.

2. Viabilidad del embarazo

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Table 2. Guidelines for Transvaginal Ultrasonographic Diagnosis of Pregnancy Failure in a Woman with an Intrauterine Pregnancy of Uncertain Viability.*

Findings Diagnostic of Pregnancy Failure	Findings Suspicious for, but Not Diagnostic of, Pregnancy Failure†
Crown–rump length of ≥7 mm and no heartbeat	Crown–rump length of <7 mm and no heartbeat
Mean sac diameter of ≥25 mm and no embryo	Mean sac diameter of 16–24 mm and no embryo
Absence of embryo with heartbeat ≥2 wk after a scan that showed a gestational sac without a yolk sac	Absence of embryo with heartbeat 7–13 days after a scan that showed a gestational sac without a yolk sac
Absence of embryo with heartbeat ≥11 days after a scan that showed a gestational sac with a yolk sac	Absence of embryo with heartbeat 7–10 days after a scan that showed a gestational sac with a yolk sac
	Absence of embryo ≥6 wk after last menstrual period
	Empty amnion (amnion seen adjacent to yolk sac, with no visible embryo)
	Enlarged yolk sac (>7 mm)
	Small gestational sac in relation to the size of the embryo (<5 mm difference between mean sac diameter and crown–rump length)

* Criteria are from the Society of Radiologists in Ultrasound Multispecialty Consensus Conference on Early First Trimester Diagnosis of Miscarriage and Exclusion of a Viable Intrauterine Pregnancy, October 2012.

† When there are findings suspicious for pregnancy failure, follow-up ultrasonography at 7 to 10 days to assess the pregnancy for viability is generally appropriate.

2. Viabilidad del embarazo

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RESEARCH

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Accepted: 11 August 2015

Defining safe criteria to diagnose miscarriage: prospective observational multicentre study

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WHAT THIS STUDY ADDS

On an initial scan an empty gestational sac of mean diameter ≥25 mm was 100% specific for miscarriage, as was an embryo with no heart activity and a CRL ≥7 mm

Beyond 70 days' gestation, an MSD ≥18 mm with no embryo was 100% specific for miscarriage as was an embryo with CRL ≥3 mm with no heart activity

For repeat scans, a pregnancy with an embryo with no heart activity on initial scan and a repeat scan ≥7 days later was 100% specific for miscarriage, as was a pregnancy with no embryo and an MSD <12 mm if sac size had not doubled after ≥14 days, and pregnancies with no embryo and MSD ≥12 mm with no embryo heart activity after ≥7 days

2. Viabilidad del embarazo

Table 5 | Proposals for diagnostic criteria for miscarriage based on this study

Our recommendations to definitively diagnose miscarriage	Positive predictive value (%, 95% CI)	Specificity (%, 95% CI)
Agreement with current criteria:		
Presenting with no visible embryo or yolk sac, and mean gestational sac diameter ≥25 mm	12/12 (100, 73.5 to 100)	364/364 (100, 99.0 to 100)
Presenting with an embryo with no heart activity, and crown-rump length ≥7 mm	17/17 (100, 80.5 to 100)	110/110 (100, 96.7 to 100)
Suggested additional new criteria		
Initial scan criteria:		
Presenting with an embryo with crown-rump length ≥3 mm, and gestational age ≥70 days	102/102 (100, 96.4 to 100)	87/87 (100, 95.8 to 100)
Presenting with no visible embryo: mean gestational sac diameter ≥18 mm and gestational age ≥70 days (10 weeks) from date of known last menstrual period	52/52 (100, 93.2 to 100)	907/907 (100, 99.6 to 100)
Repeat scan criteria:		
Presenting with no visible embryo (with or without visible yolk sac) with mean gestational sac diameter ≥12 mm and returning after at least seven days: no embryo with embryo heart activity visible	130/130 (100, 97.2 to 100)	150/150 (100, 97.6 to 100)
Presenting without an embryo (with or without visible yolk sac) with mean gestational sac diameter <12 mm and returning after at least 14 days: no embryo heart activity and mean gestational sac diameter has not doubled	41/41 (100, 91.4 to 100)	478/478 (100, 99.2 to 100)
Presenting with an embryo (irrespective of crown-rump length) without heart activity, and still no heart activity visible after at least seven days	191/191 (100, 98.1 to 100)	103/103 (100, 96.5 to 100)

Modified Jeffreys method used for confidence intervals when percentages equalled 100% (or 0%). Standard Jeffreys methods used otherwise.

3. Edad gestacional

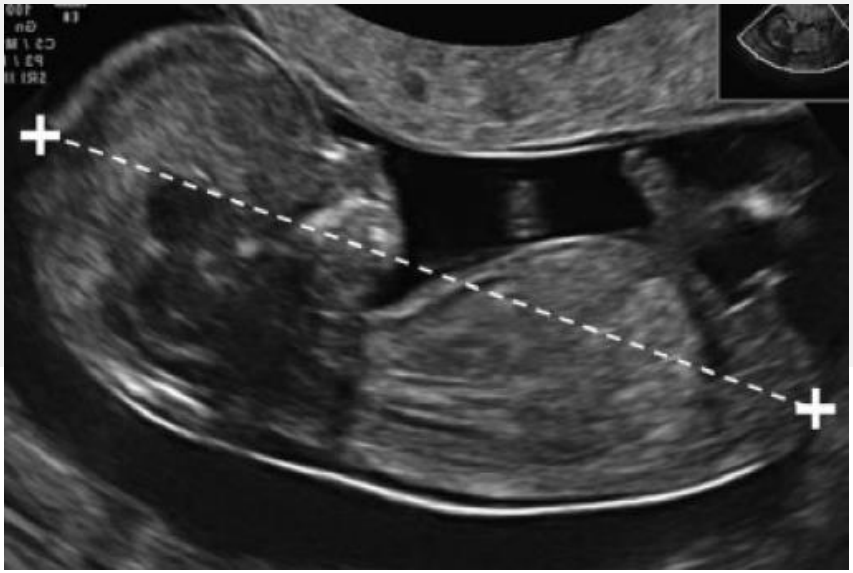
3. Edad gestacional

- FUR inexacta hasta en un 30%, 3 semanas o más.

- La mayor precisión de la estimación de EG es mediante **Longitud Céfalo Nalgas (LCN)**
  - Útil hasta los 84 mm (13+6 semanas).

3. Edad gestacional: Longitud Céfalo Nalgas

- Feto en posición neutra.
- Corte sagital.
- Líquido amniótico entre mentón y pecho.
- Desde coronilla hasta nalgas.



3. Edad gestacional: Longitud Céfalo Nalgas

- Difícil de lograr en etapas muy tempranas del embarazo (6-9 semanas):
  - Embrión hiperflexionado.
  - Medición real está representada por la longitud del cuello-rabadilla.
  - Difícil distinguir entre los extremos cefálico y caudal y una mayor longitud se mide en su lugar .

3. Edad gestacional

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Table 1. Guidelines for Redating Based on Ultrasonography ⇦

Gestational Age Range*	Method of Measurement	Discrepancy Between Ultrasound Dating and LMP Dating That Supports Redating
≤13 6/7 wk	CRL	
• ≤ 8 6/7 wk		More than 5 d
• 9 0/7 wk to 13 6/7 wk		More than 7 d
14 0/7 wk to 15 6/7 wk	BPD, HC, AC, FL	More than 7 d
16 0/7 wk to 21 6/7 wk	BPD, HC, AC, FL	More than 10 d
22 0/7 wk to 27 6/7 wk	BPD, HC, AC, FL	More than 14 d
28 0/7 wk and beyond†	BPD, HC, AC, FL	More than 21 d

Abbreviations: AC, abdominal circumference; BPD, biparietal diameter; CRL, crown–rump length; FL, femur length; HC, head circumference; LMP, last menstrual period.

*Based on LMP.

†Because of the risk of redating a small fetus that may be growth restricted, management decisions based on third-trimester ultrasonography alone are especially problematic and need to be guided by careful consideration of the entire clinical picture and close surveillance.

4. Corionicidad

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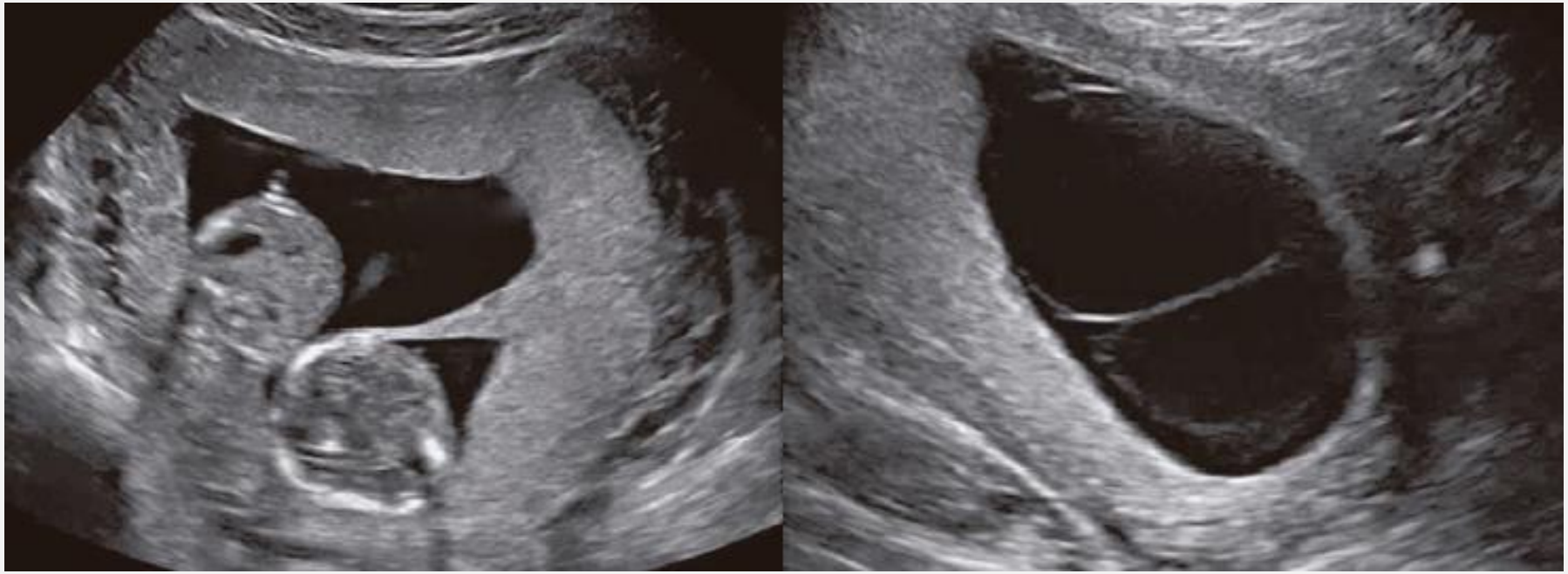

4. Corionicidad

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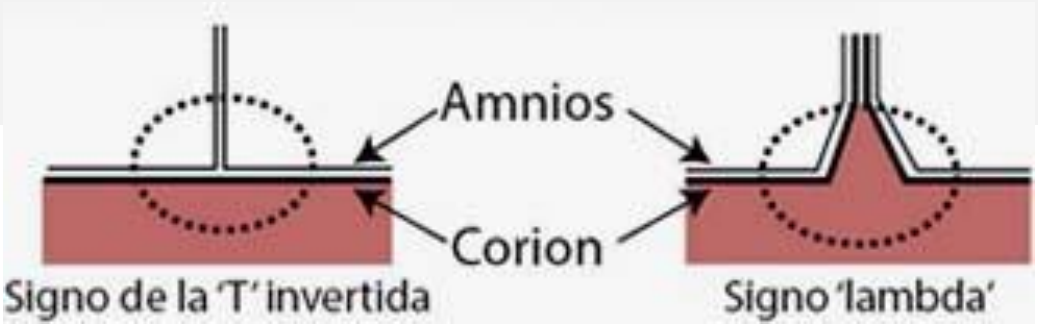
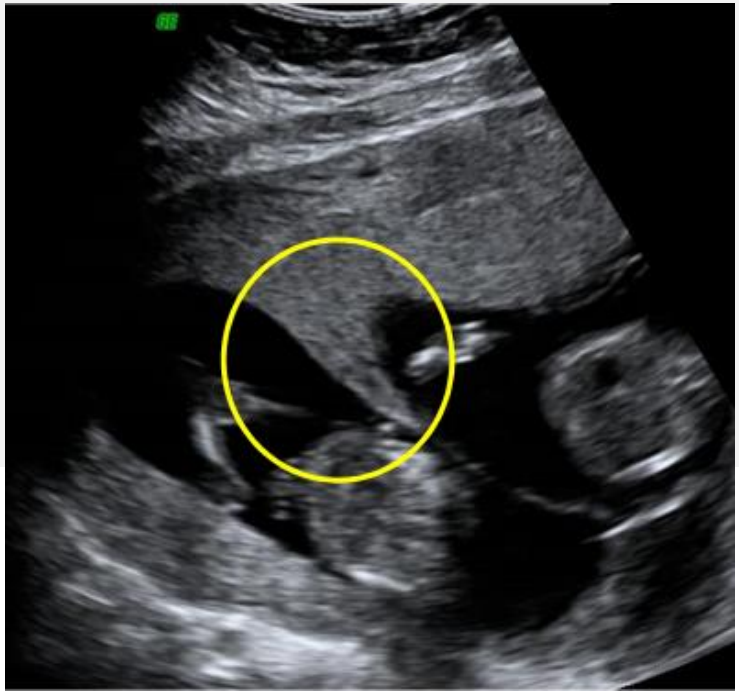
- En caso de diagnóstico de embarazo múltiple.
- La corionicidad se debe determinar antes de las 13+6 semaas, cuando el amnios y el corion aún no se han fusionado.
- Se utiliza el grosor de la membrana en el sitio de inserción de la membrana amniótica en la placenta, identificando el signo T o el signo lambda (S100% y E99,8 %), y el número de masas placentarias.
- Determinar también amnionicidad.

4. Corionicidad

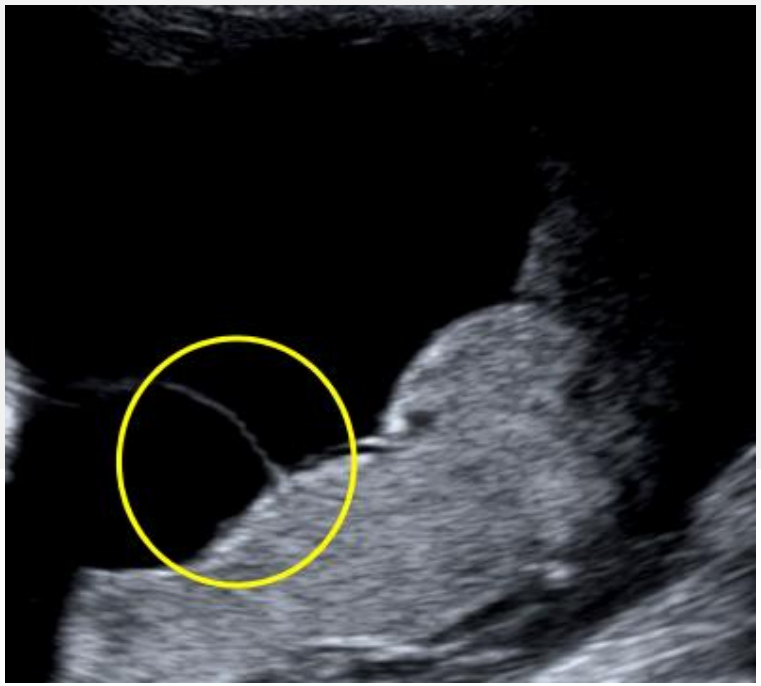
- En el embarazo gemelar **bicorial biamniótico**, los gemelos están separados por una gruesa capa de membranas coriónicas fusionadas con dos delgadas capas amnióticas, una a cada lado, dando la apariencia triangular o de un "**lambda** completo".

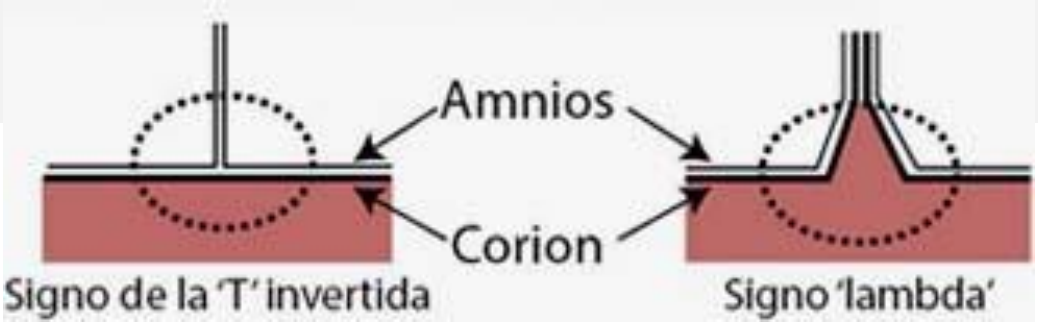




4. Corionicidad

- En el embarazo gemelar **monocorial biamniótico** se visualizan sólo las dos delgadas capas amnióticas (**signo T**) que separan a los dos fetos, formando un ángulo de 90°.





4. Corionicidad

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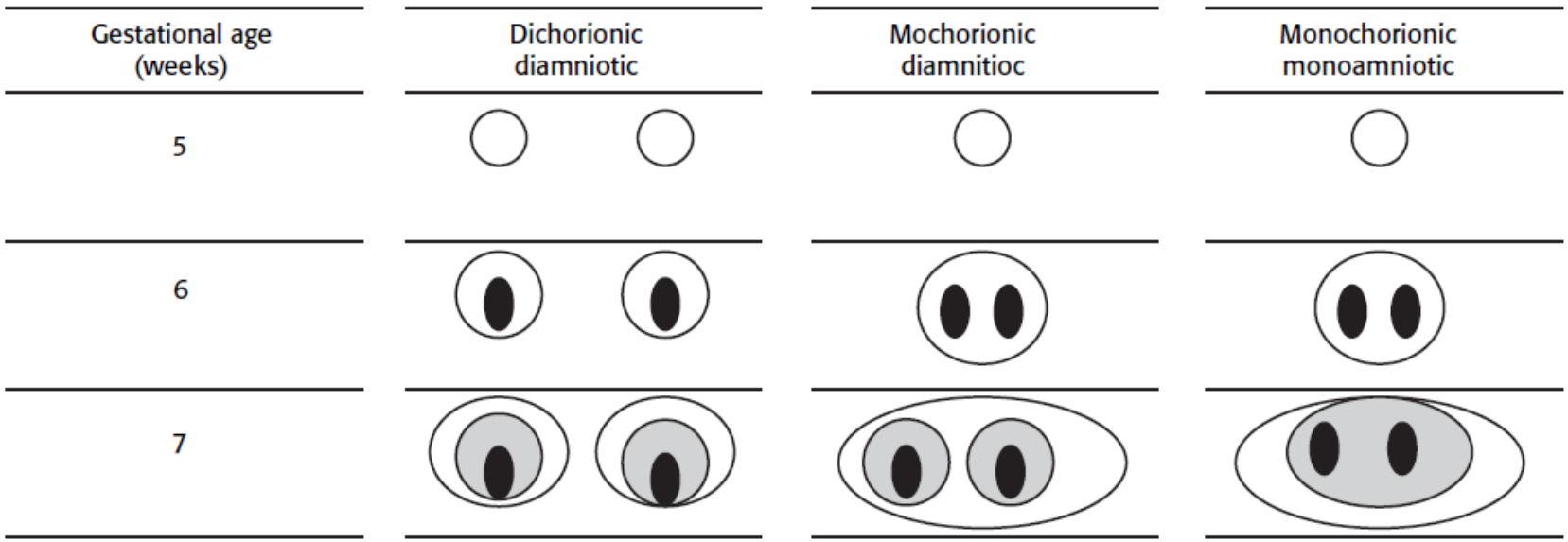
FIGURE 13.19 Principles of determining chorionicity and amnionicity in early multiple pregnancy;
○ = chorionic cavity
◌ = amniotic cavity
● = embryo



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