

Twin placentas

Membranes, shared circulation and clinicopathologic consequences

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Learning outcomes

- Classify twins by chorionicity and amnionicity
- Explain membrane anatomy and fetal circulations
- Trace the mechanism of twin-to-twin transfusion
- Apply findings to prenatal assessment and placental examination

Three questions define the placentation

Origin

One fertilized ovum or
two?

Chorionicity

One shared chorion or
two?

Amnionicity

One amniotic cavity or
two?

These three classifications answer different questions.

Two biological routes to twins

Two ova fertilized



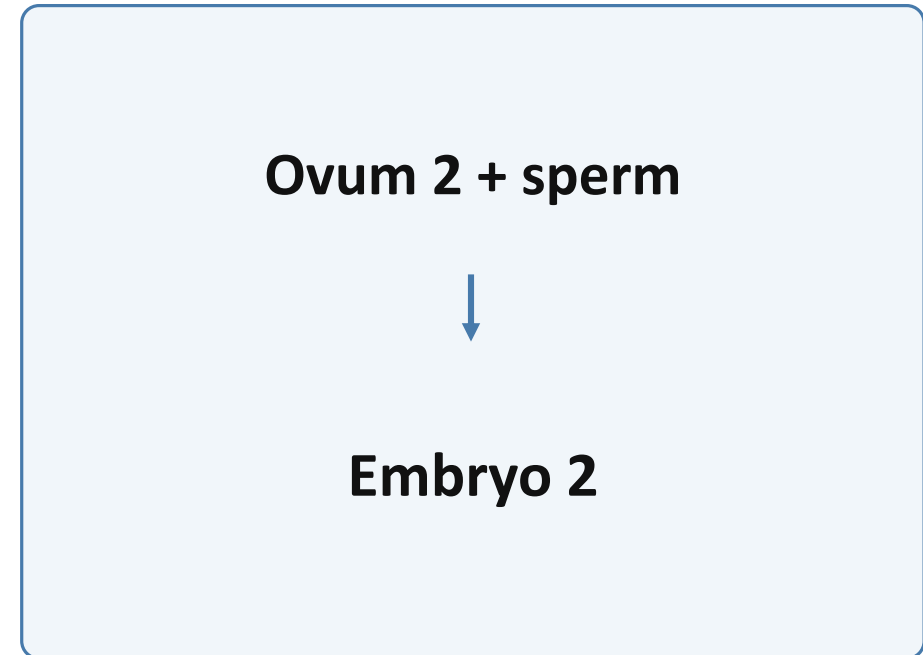
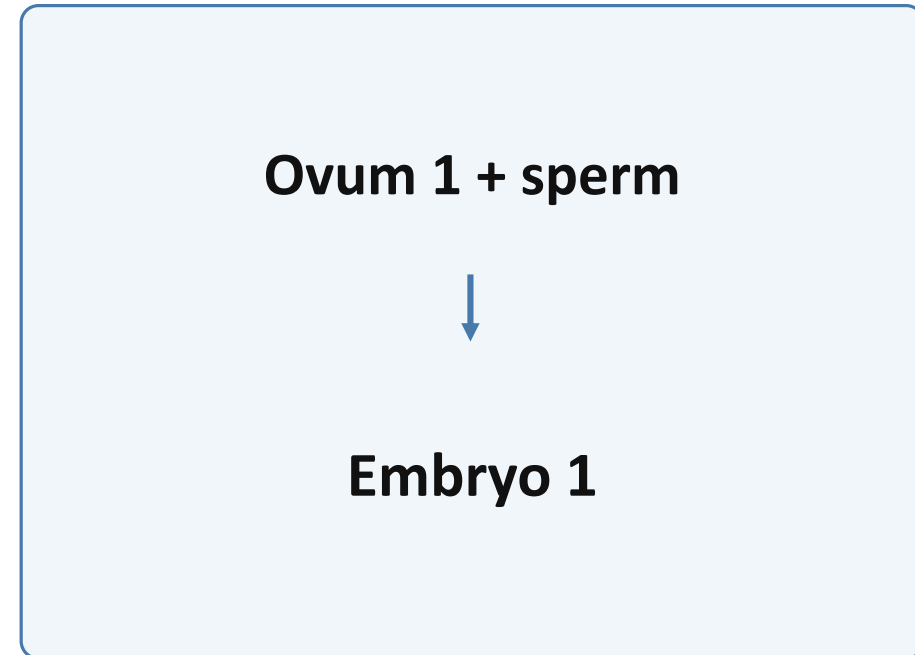
Dizygotic twins

One fertilized ovum divides



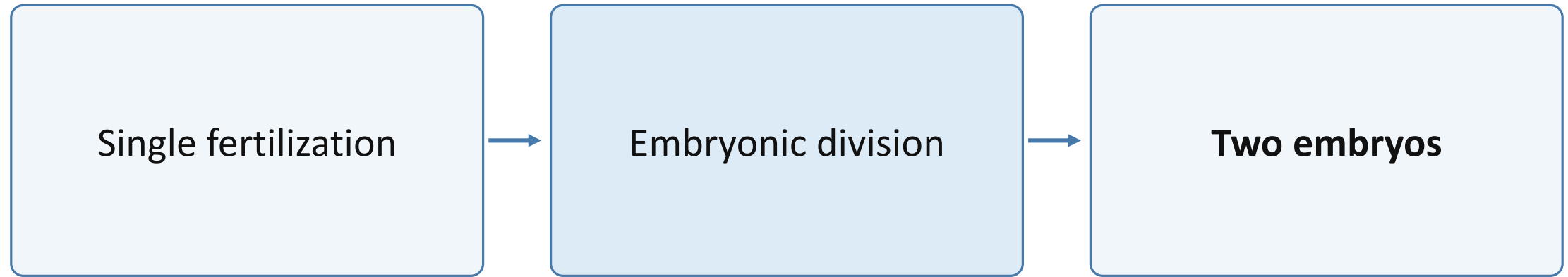
Monozygotic twins

Dizygotic: Two fertilizations



Dizygotic twins normally form dichorionic diamniotic pregnancies.

Monozygotic: One conception, two embryos



The timing of splitting influences placental and membrane configuration.

Chorion and amnion are not synonyms

Chorion

Outer fetal membrane

Defines chorionic sharing

Shared chorion permits connected placental circulation

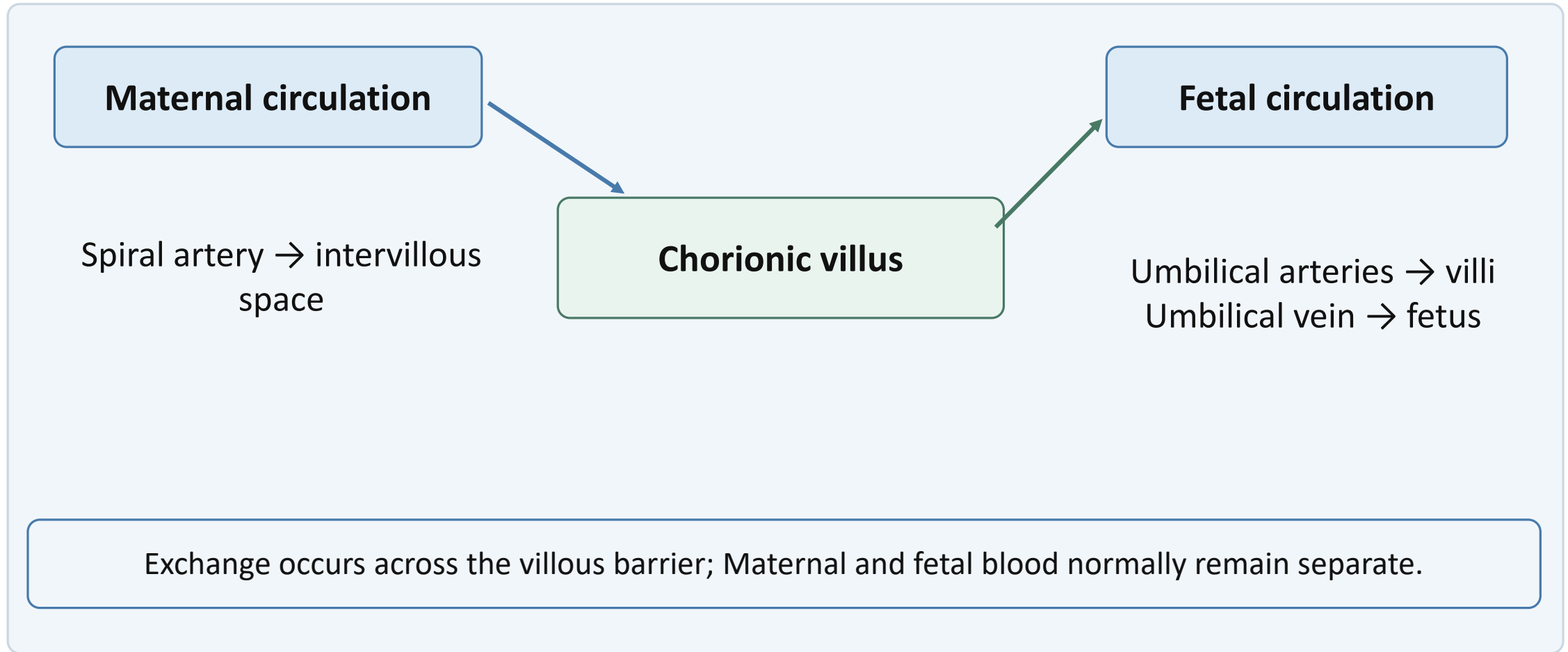
Amnion

Inner fetal membrane

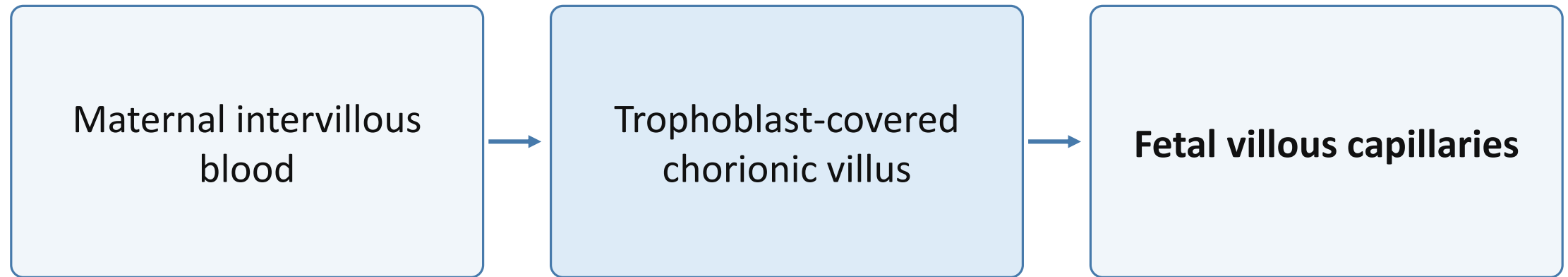
Defines amniotic cavities

Separating membrane may be present or absent

Placental function: Two circulatory systems

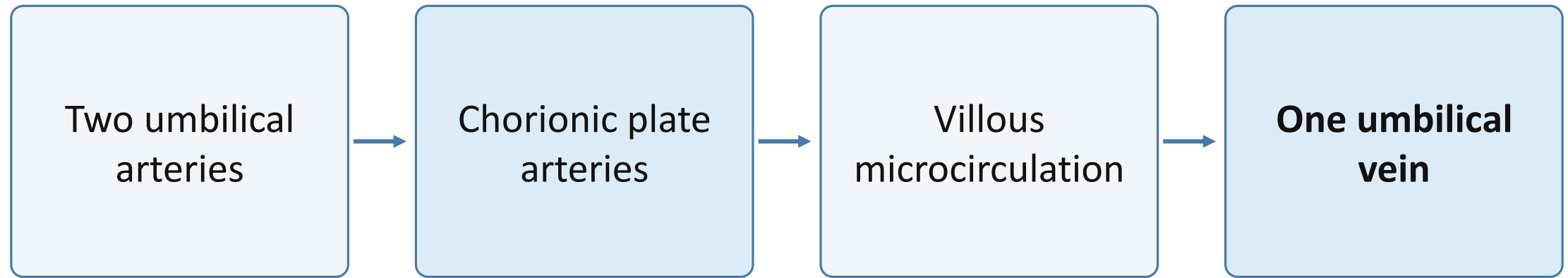


The villus is the exchange unit



Maternal and fetal circulations are normally separate across an exchange barrier.

Umbilical vessels supply the fetal placental tree



Fetal vessels—not maternal intervillous blood—form intertwin connections.

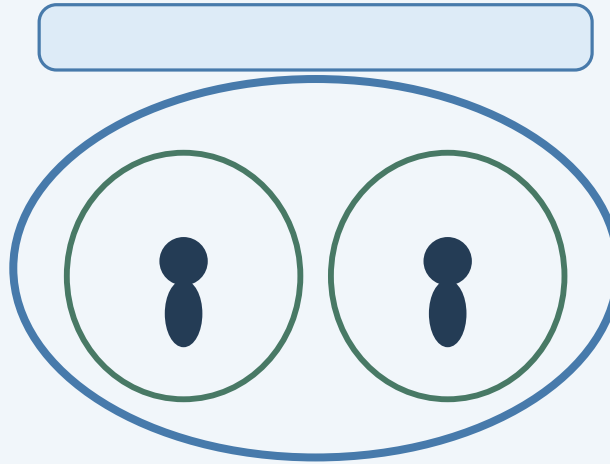
Three principal twin placental configurations

DCDA



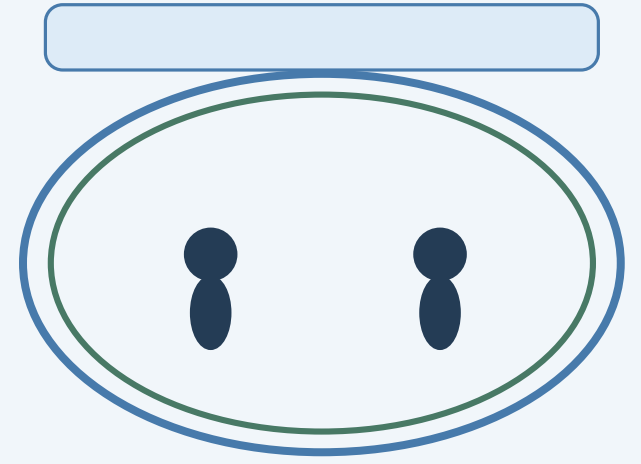
Two chorions
Two amnions

MCDA



One chorion
Two amnions

MCMA

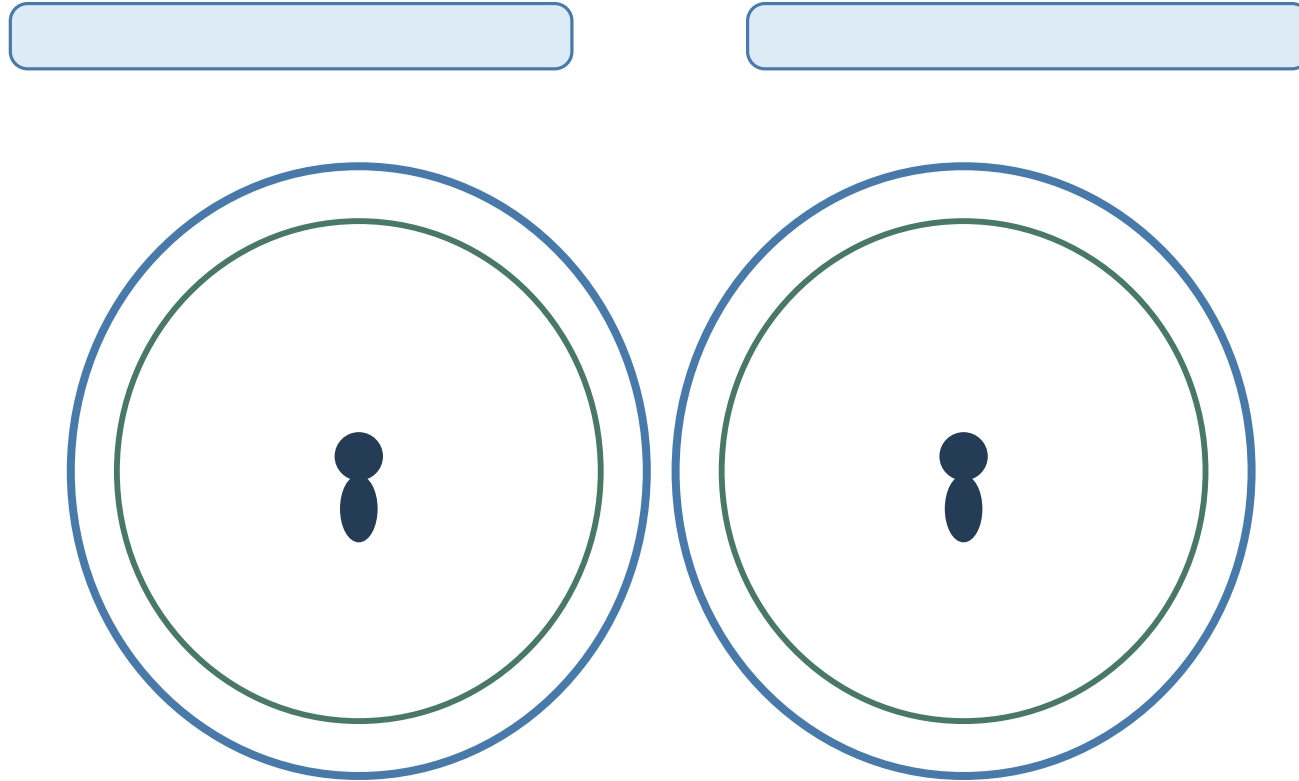


One chorion
One amnion

What changes across the three patterns?

Configuration	Chorions	Amniotic sacs	Intertwin membrane
DCDA	Two	Two	Present
MCDA	One	Two	Present
MCMA	One	One	Absent

DCDA: Two placentas may be separate



Separate dichorionic discs

Each fetus has its own chorion.

Each fetus has its own amniotic sac.

Two placental discs may be distinct.

DCDA: Two placentas may appear fused



Fused dichorionic discs

Adjacent dichorionic placentas can fuse grossly.

Fusion does not convert two chorions into one.

The intertwin membrane resolves the classification.

Placental disc count is not chorionicity

What is seen

A single placental mass

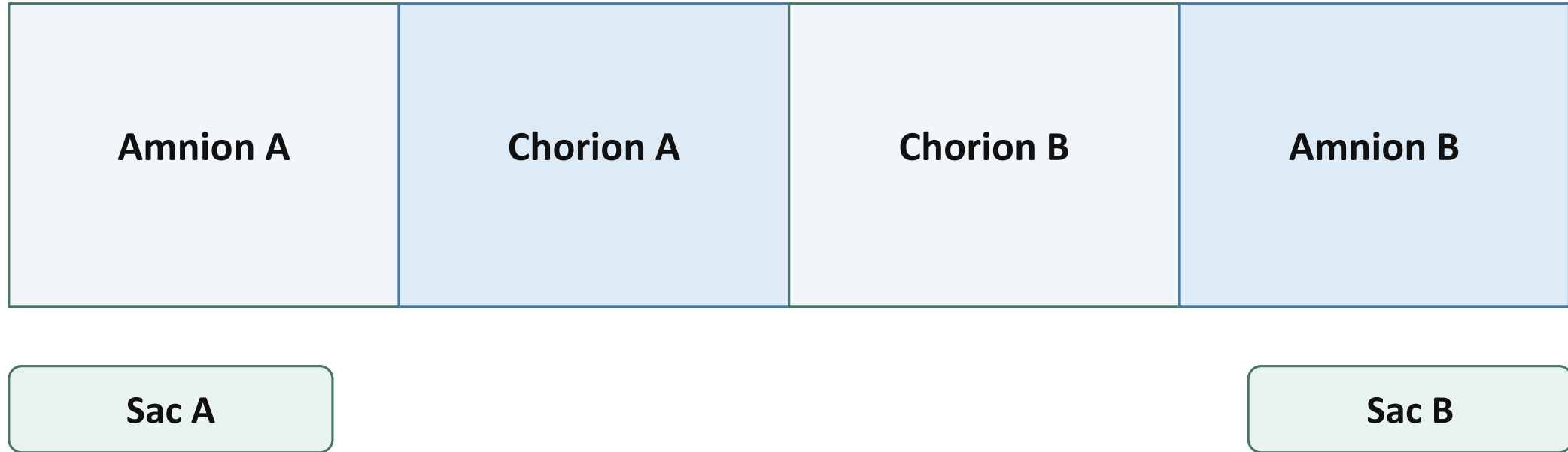
Could be monochorionic OR fused dichorionic

What it means

Two separate placental masses

Suggests dichorionicity; Use membrane features and prenatal imaging to confirm

DCDA intertwin membrane: Four layers



Schematic membrane sequence between the two amniotic cavities.

Dichorionic does not establish dizygosity

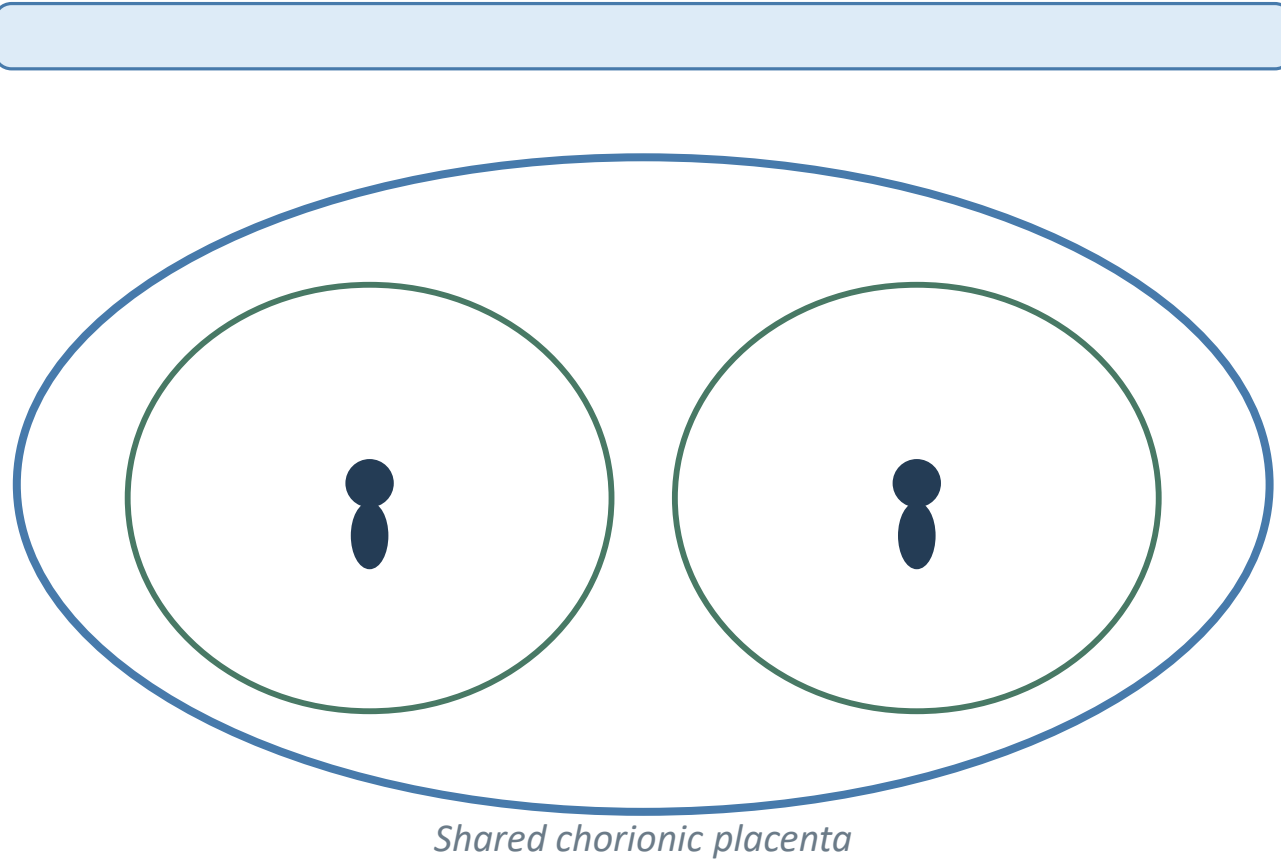
Dichorionic placenta



Either dizygotic or monozygotic origin

Both pathways may produce DCDA anatomy.

MCDA: One chorion, two amnions



A common chorionic
placental unit

Two fluid compartments

A thin intertwin amniotic
membrane

MCDA dividing membrane: Two amnions

Amnion A

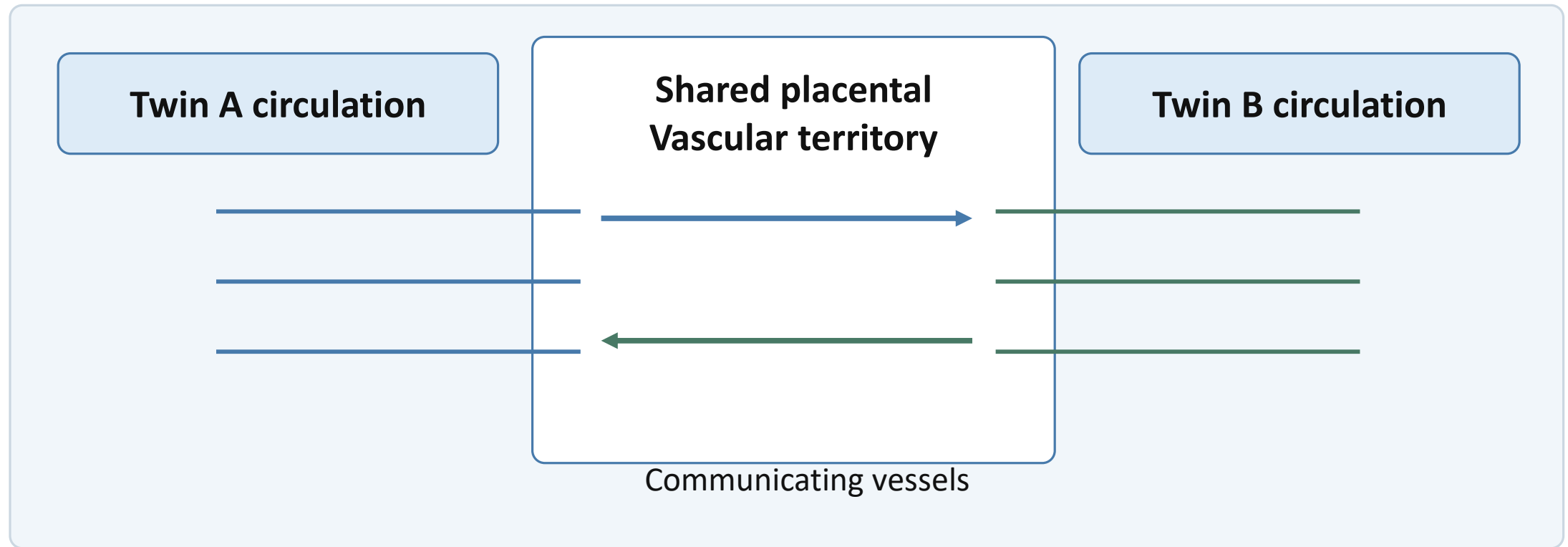
Amnion B

Sac A

Sac B

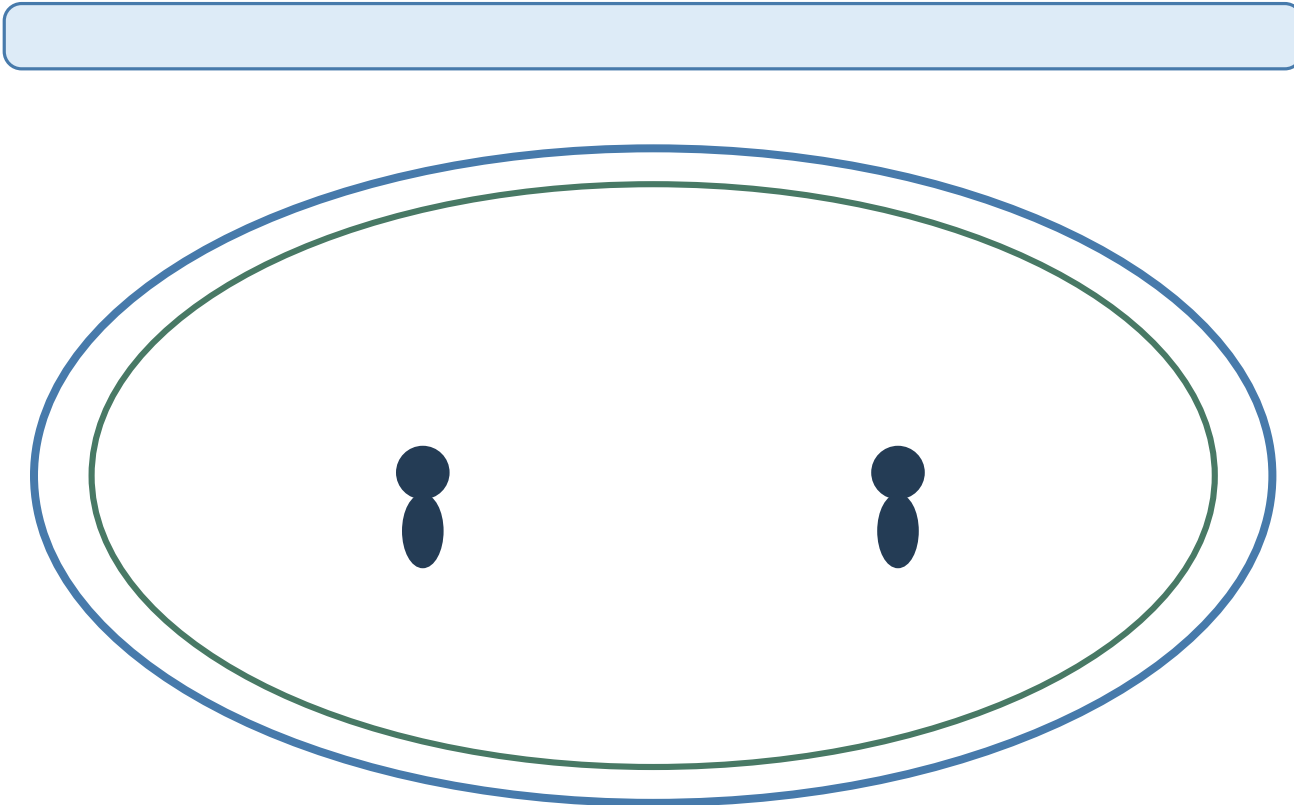
Chorionic layers are absent from the intertwin membrane.

Why MCDA twins share vascular risk



Two fetal vascular territories lie within a single chorionic placenta.

MCMA: One chorion, one amnion



Shared chorionic + amniotic cavity

Common chorionic placenta

A shared amniotic cavity

No intertwin dividing
membrane

No dividing membrane changes the risk profile

Anatomic feature

Both fetuses occupy one amniotic cavity

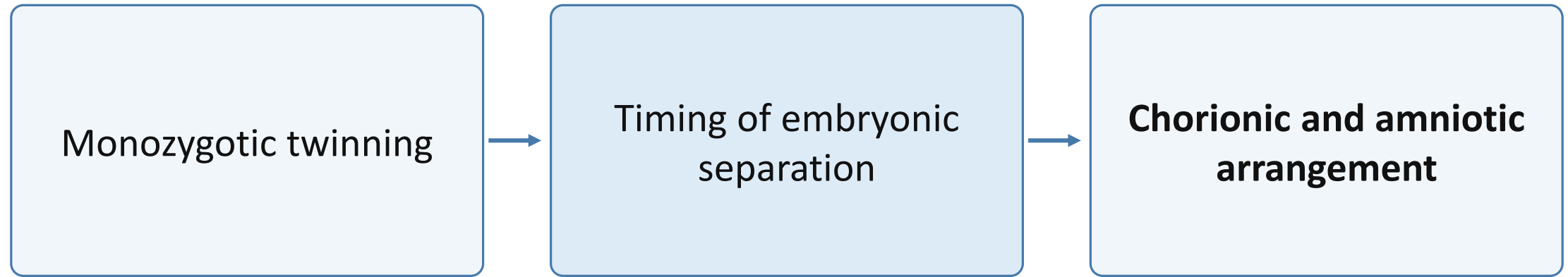
Two umbilical cords occupy that space

Clinical implication

Cord entanglement is an important concern

Management requires specialized surveillance

Splitting influences membrane development



Do not infer a precise splitting day from a placental specimen.

Monozygotic does not mean monochorionic

Monozygotic twins

Can be dichorionic or monochorionic

Chorionicity depends on developmental timing

Dizygotic twins

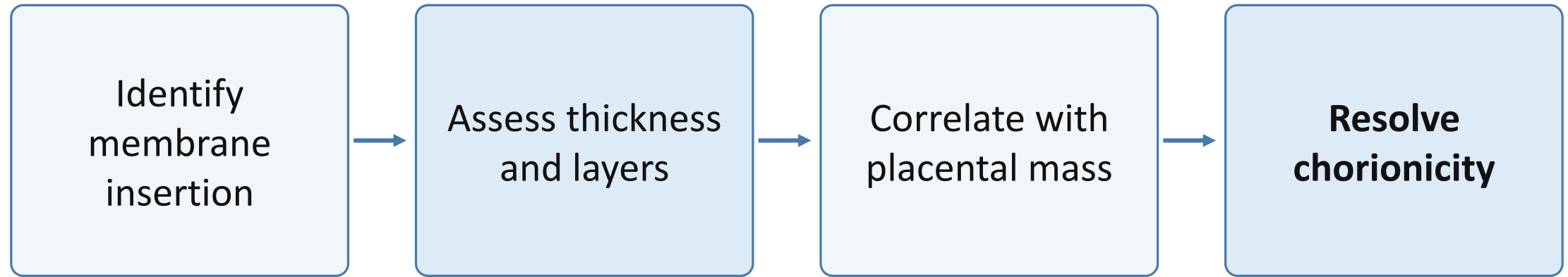
Usually dichorionic diamniotic

Two ova were independently fertilized

Anatomical classification: One-view matrix

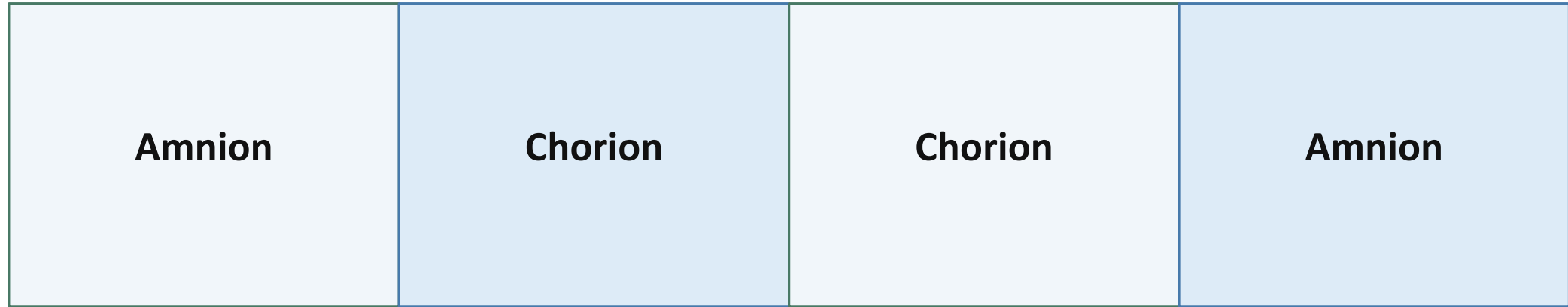
Pattern	Shared chorion?	Shared amnion?	Vascular linkage?
DCDA	No	No	Not typical; Rare exceptions described
MCDA	Yes	No	Common
MCMA	Yes	Yes	Common

Examine the entire intertwin septum



An isolated gross photograph may not capture the full membrane anatomy.

DCDA membrane is thicker



Sac A

Sac B

Two chorionic layers contribute to a thicker septum than MCDA.

MCDA membrane is comparatively thin

Amnion

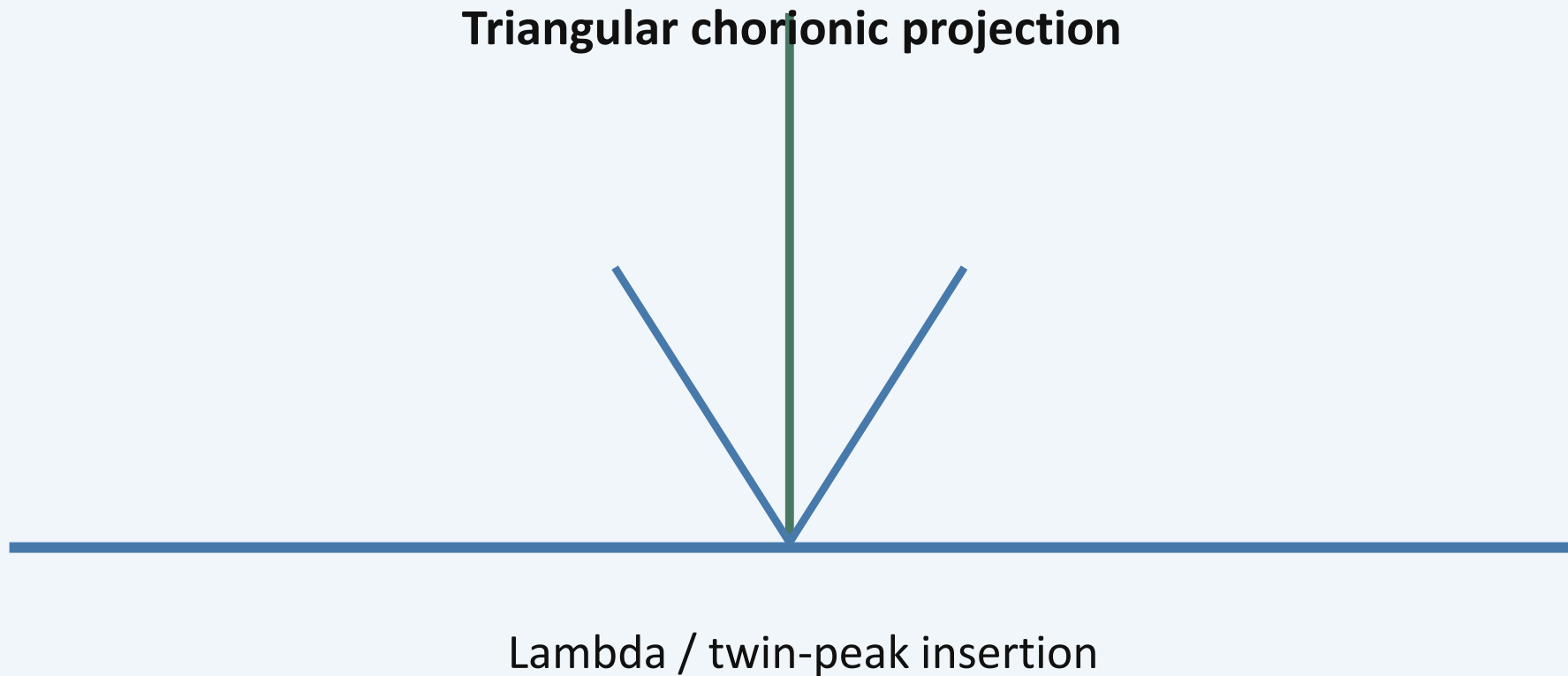
Amnion

Sac A

Sac B

Only paired amnions form the dividing membrane.

Prenatal lambda sign suggests DCDA



Original schematic — not a diagnostic ultrasound image

Prenatal T sign suggests MCDA

Thin intertwin membrane meets placenta



T-shaped insertion

Original schematic — not a diagnostic ultrasound image

Determine chorionicity early

First trimester

Assess chorionicity and
amnionicity



Before 13 + 6 weeks

Use multiple sonographic
signs



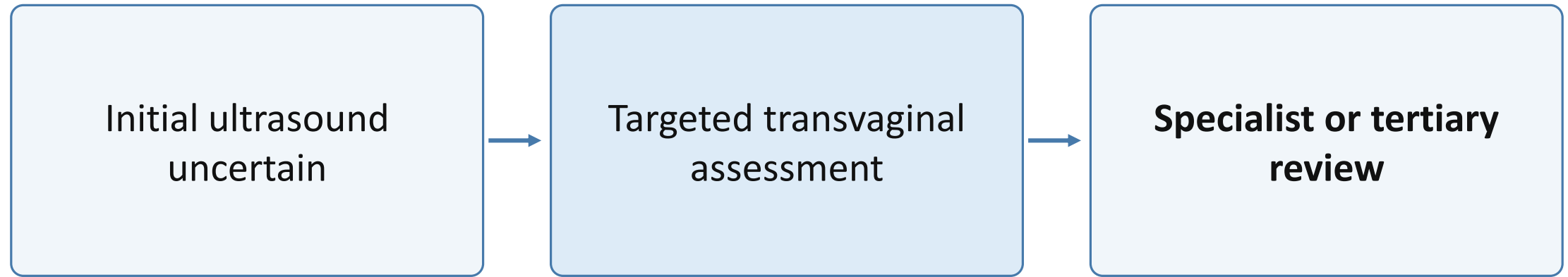
Uncertain

Seek expert review

Use convergent features, not a single sign

- Evaluate the entire intertwin membrane
- Inspect its placental insertion (lambda / T sign)
- Consider membrane thickness and placental masses
- Preserve diagnostic ultrasound images

Uncertain chorionicity requires escalation

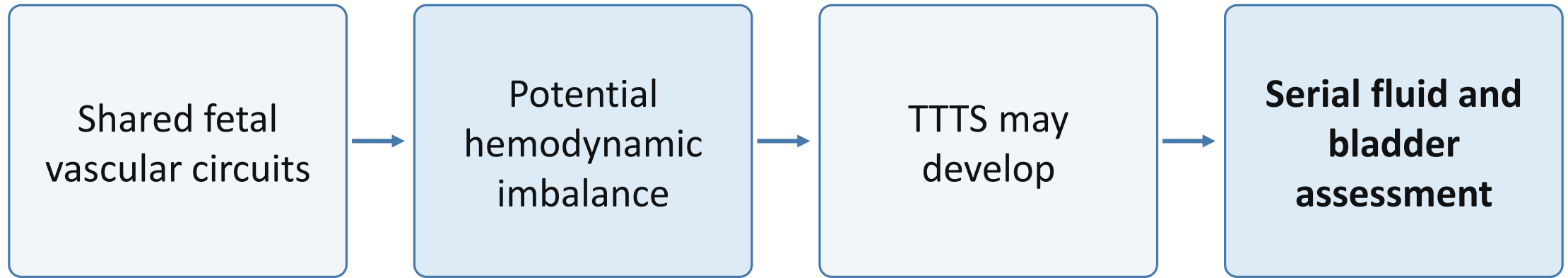


Do not classify a fused placental mass from disc number alone.

Surveillance differs by chorionicity

Pregnancy type	Uncomplicated follow-up pattern
DCDA	First-trimester scan; Anatomy scan; Generally every 4 weeks thereafter
Monochorionic	First trimester, then every 2 weeks from 16 weeks

Why monochorionic surveillance is closer

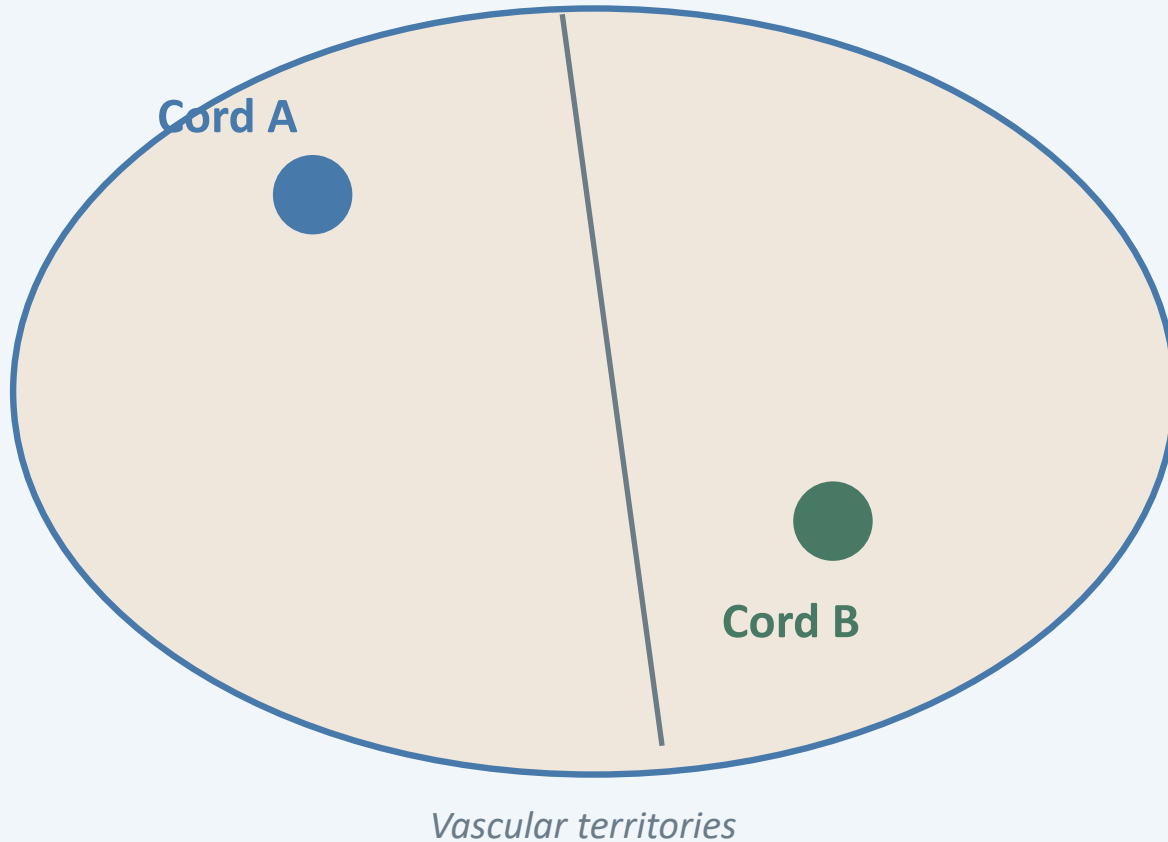


Placental anatomy predicts a mechanism that serial ultrasound can monitor.

Gross assessment begins with identity

- Associate each cord with the correct infant
- Record separate or fused placental discs
- Describe cord insertions and dividing membranes
- Preserve orientation before destructive dissection

Fused placental specimen: Structured examination



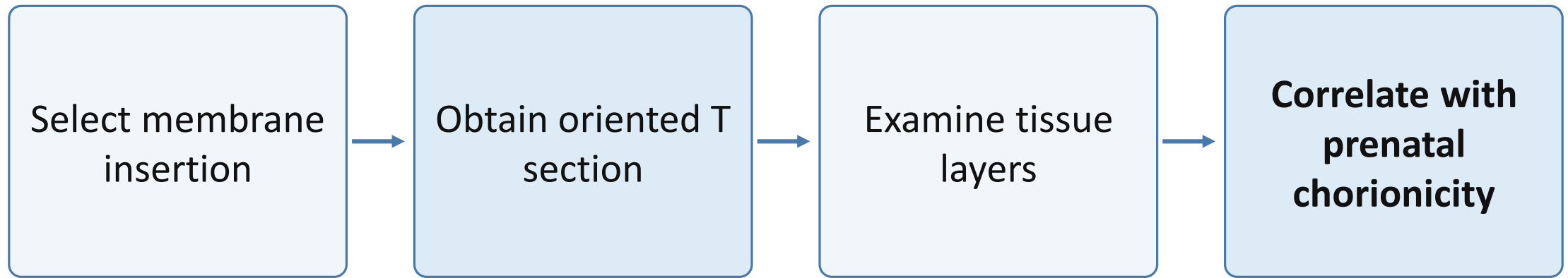
Mark cord A and cord B

Identify membrane insertion

Map territories on the chorionic plate

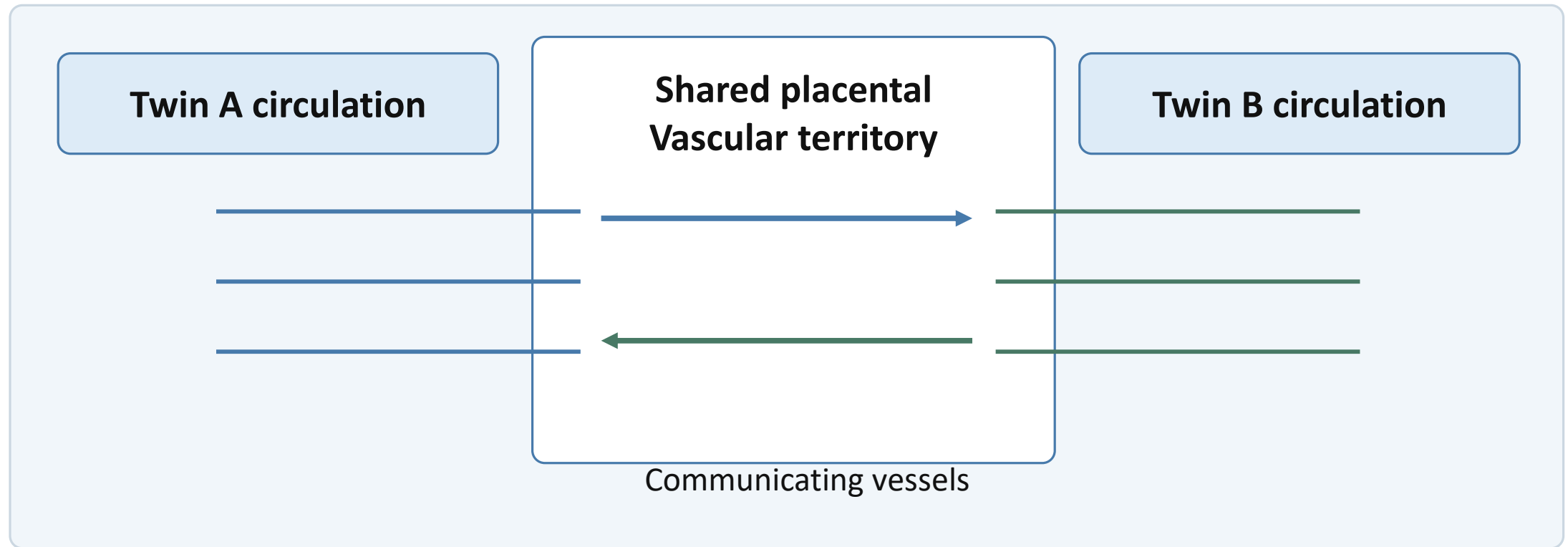
Inspect visible crossing vessels

Membrane sampling confirms architecture



Correct orientation is important when classifying the intertwin septum.

Monochorionic placentas can connect two circulations



Anastomoses connect fetal vessels across placental territories.

Vascular communications have different patterns

Artery–artery

Direct arterial
connection

Vein–vein

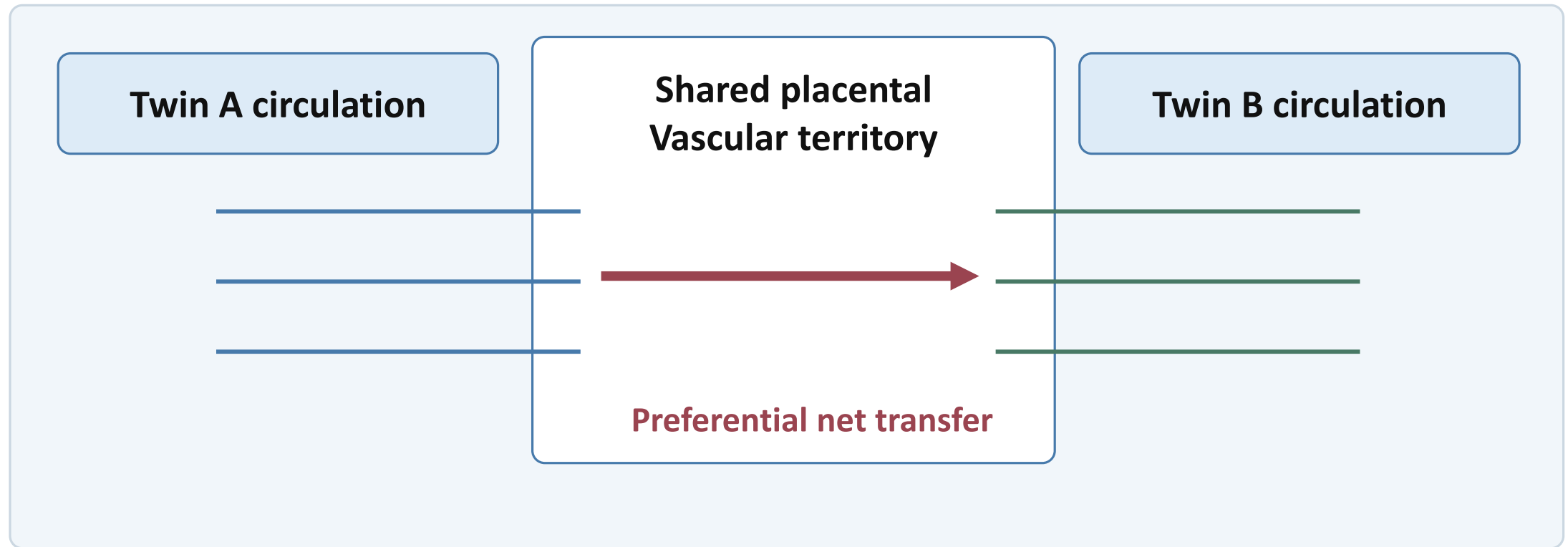
Direct venous
connection

Artery–vein

Deep unidirectional-
type pathway

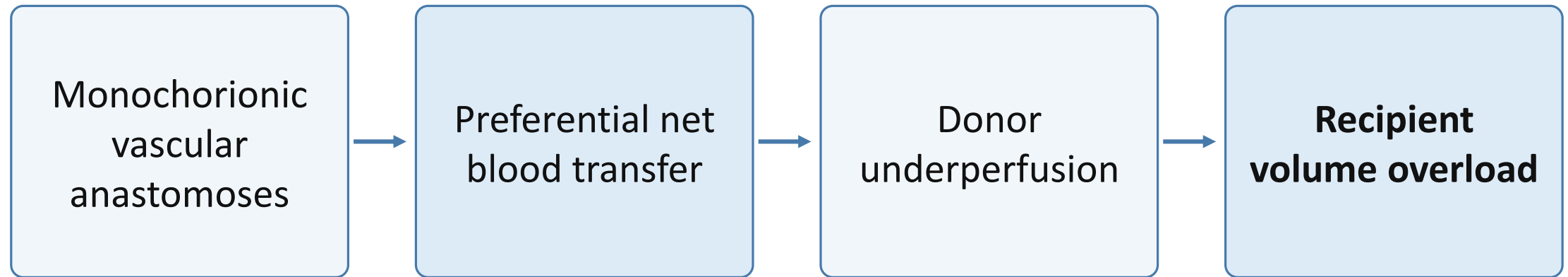
The number, caliber and balance of communications matter; Schematic classes.

Net flow—not the mere connection—drives TTTS



Illustrated preferential net transfer between fetal circulations.

TTTS: Defining pathophysiology



Both fetuses can be affected by one shared placental vascular imbalance.

The donor is relatively underperfused

Hemodynamic change

Net blood transfer away from donor

Reduced effective circulating volume

Consequences

Reduced urine production

Reduced amniotic fluid volume

The recipient becomes fluid overloaded

Hemodynamic change

Net blood transfer toward recipient

Increased effective circulating volume

Consequences

Increased urine and amniotic fluid

Cardiovascular strain in severe disease

Two fetuses, opposing fluid phenotypes

Donor

Underperfused

Oligohydramnios

Bladder may become difficult to visualize

Recipient

Volume overloaded

Polyhydramnios

Cardiovascular effects may develop

Ultrasound diagnosis requires fluid discordance

Assessment	Traditional diagnostic threshold
Donor deepest vertical pocket	≤ 2 cm
Recipient deepest vertical pocket	≥ 8 cm
Important nuance	Some guidance uses ≥ 10 cm after 20 weeks

Quintero stages describe observed severity

I

Oligohydramnios–polyhydramnios

II

Donor bladder not visible

III

Critical fetal Doppler abnormality

IV

Hydrops in at least one twin

V

Fetal death

Stage I: Fluid imbalance with visible donor bladder

Prerequisite

Donor oligohydramnios

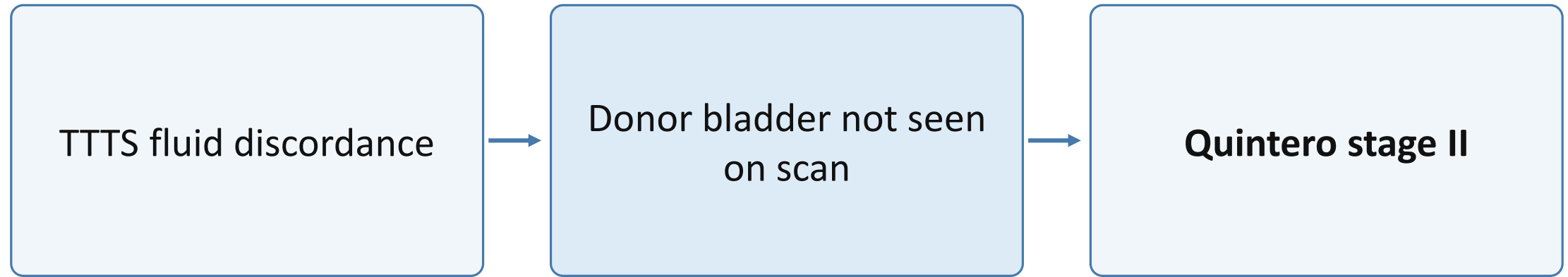
Recipient polyhydramnios

Discriminator

Donor bladder remains visible

Severity cannot be judged from fluid
alone

Stage II: Donor bladder is not visualized



Bladder assessment is part of routine monochorionic surveillance.

Stage III: Critical Doppler abnormality

- Absent or reversed umbilical artery end-diastolic flow
- Reversed ductus venosus flow
- Pulsatile umbilical venous flow
- An abnormality in either fetus may satisfy this stage

Stages IV–V: Hydrops or fetal demise

Stage IV

Hydrops in one or both twins

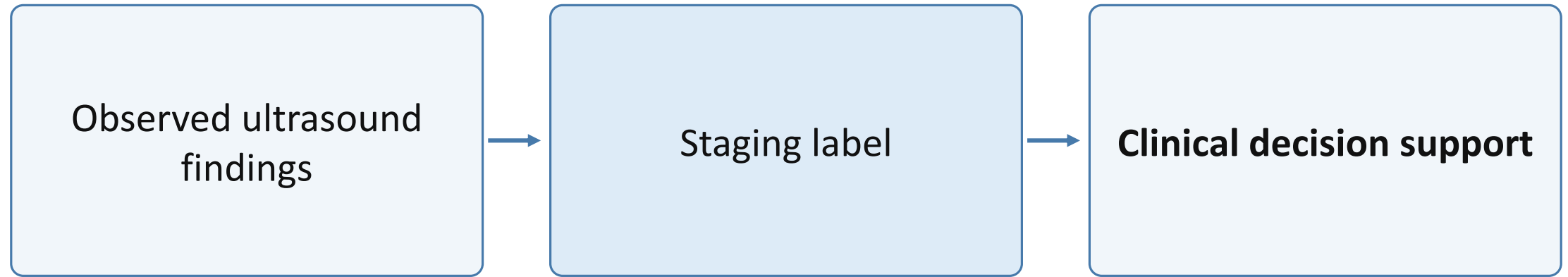
Represents severe fetal circulatory
decompensation

Stage V

Death of one or both twins

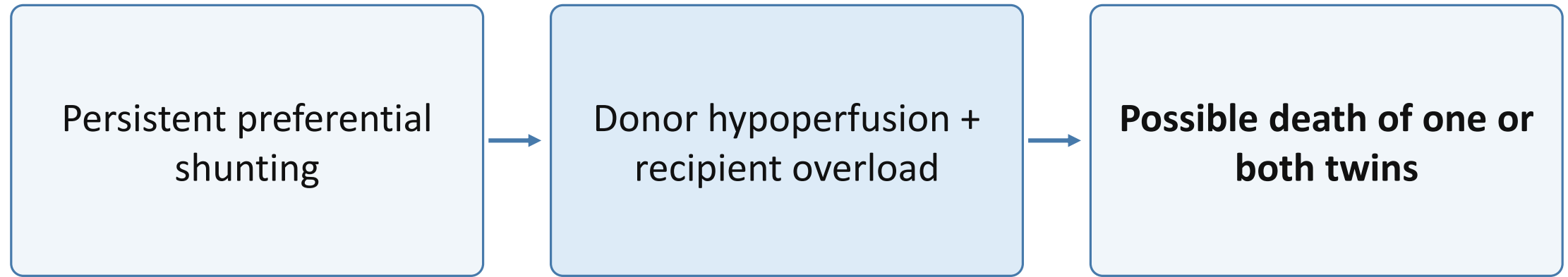
A possible severe outcome of transfusion
imbalance

Quintero stage is not a time sequence



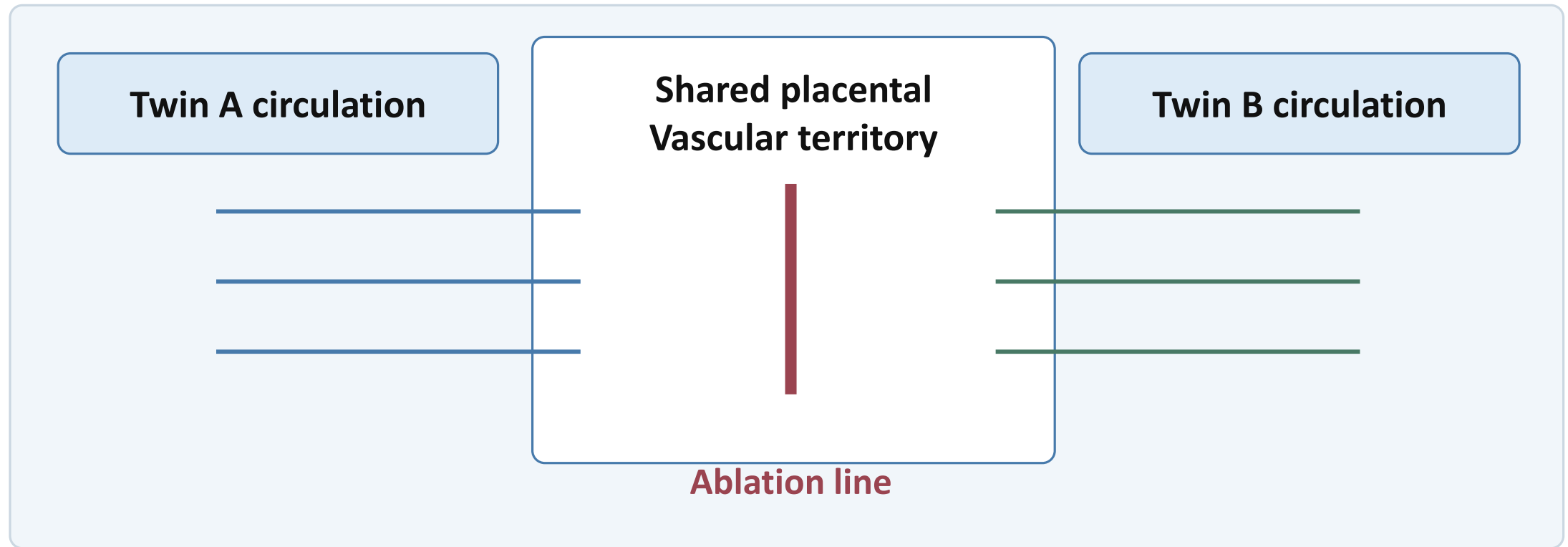
Progression need not pass through each stage in numerical order.

Severe TTTS may endanger both fetuses



The severity derives from asymmetric circulatory consequences.

Laser therapy targets the shared channels

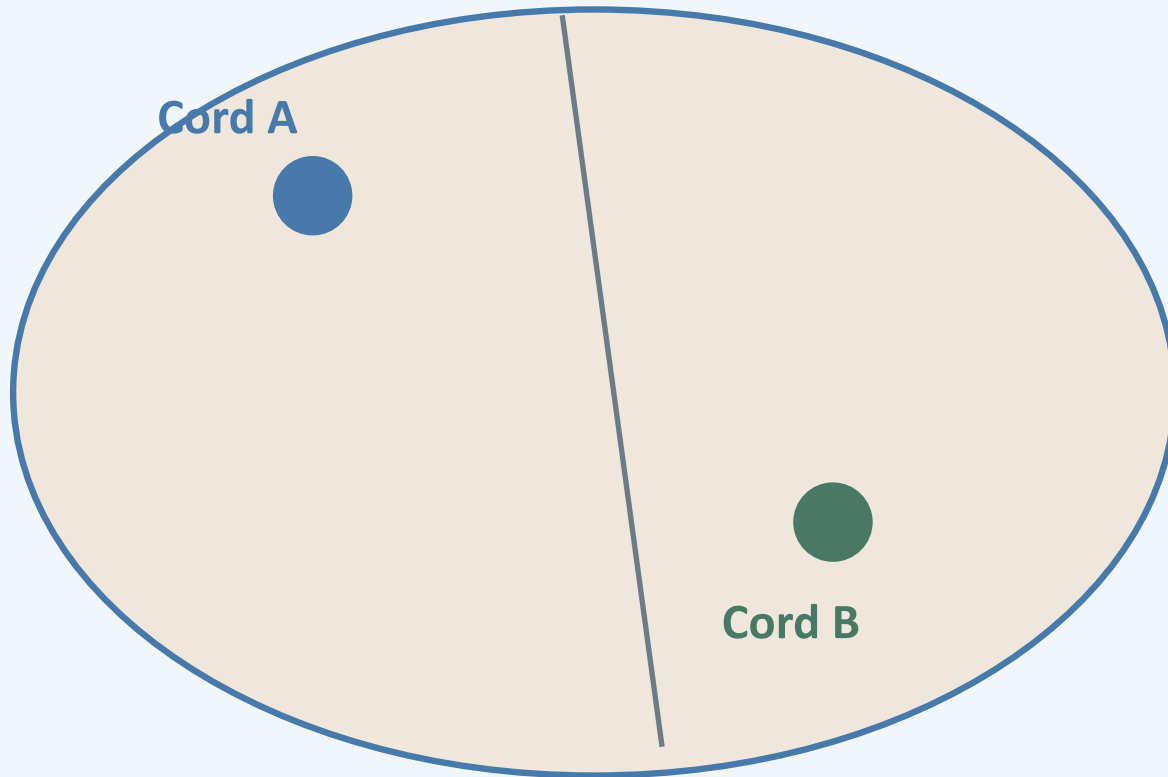


Fetoscopic laser coagulation aims to interrupt placental vascular connections.

SMFM treatment context: Stages II–IV

- For stages II–IV presenting at 16–26 weeks, fetoscopic laser is standard treatment
- Eligible cases should be evaluated at a fetal intervention center
- Stage I often requires close surveillance; Treatment is individualized

Vascular territory need not equal fetal share



Vascular territories

Identify the vascular equator

Record relative placental territory for each cord

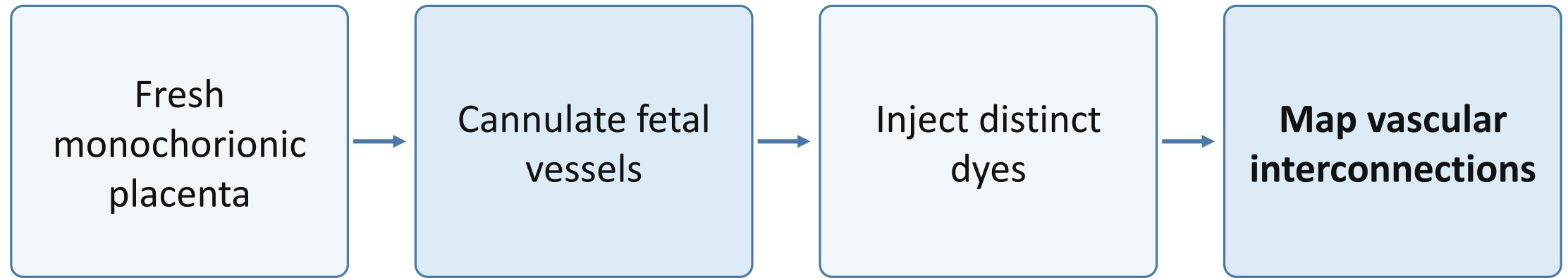
Describe anastomoses where visible

Correlate with growth discordance

Pathology report: Information for each twin

- Chorionicity and amnionicity
- Individual cord and membrane findings
- Separate diagnoses attributable to twin A and twin B
- Vascular territory and communications in monochorionic placentas

Injection studies map intertwin vessels



Specialized studies can delineate communications beyond routine inspection.

Twin discordance has multiple causes

Growth

Twin size can differ

Development

Karyotype or
malformations may
differ

Placental pathology

Territory and lesions
may differ

Discordance is not synonymous with TTTS.

TTTS versus selective growth restriction

TTTS

Mechanism centers on intertwin
hemodynamic imbalance

Characteristically opposing fluid volumes

Selective fetal growth restriction

Mechanism commonly includes unequal
placental sharing

Abnormal growth does not itself establish
TTTS

TTTS versus TAPS

TTTS

Amniotic fluid imbalance defines classic TTTS

Oligohydramnios–polyhydramnios pattern

TAPS

Chronic intertwin hematologic discordance

May lack classic fluid imbalance; Doppler-based assessment

Case: One mass with a thick membrane

Twins have a single gross placental mass, but the dividing membrane contains chorionic layers. What is the chorionicity?

Dichorionic. Fused DCDA placentas can resemble one disc grossly.

The disc count alone is misleading.

The membrane layers resolve the classification.

Case: Thin membrane and two fluid sacs

Two fetuses occupy separate amniotic sacs within one chorion; The dividing membrane has two amnions only. Classify the placenta.

Monochorionic diamniotic (MCDA).

Two sacs do not imply two chorions.

Shared placental vasculature is clinically important.

Case: Shared sac with two cords

A monochorionic placenta has no true intertwin membrane. Which configuration is present?

Monochorionic monoamniotic (MCMA).

Both fetuses occupy a common amniotic cavity.

Cord entanglement is an important additional risk.

Case: Opposing deepest fluid pockets

A monochorionic diamniotic pair has donor DVP 1.5 cm and recipient DVP 9 cm at 19 weeks. Which syndrome should be suspected?

Twin-to-twin transfusion syndrome (TTTS).

The values satisfy the traditional fluid criteria.

Evaluate donor bladder and Doppler for staging.

Case: Absent donor bladder

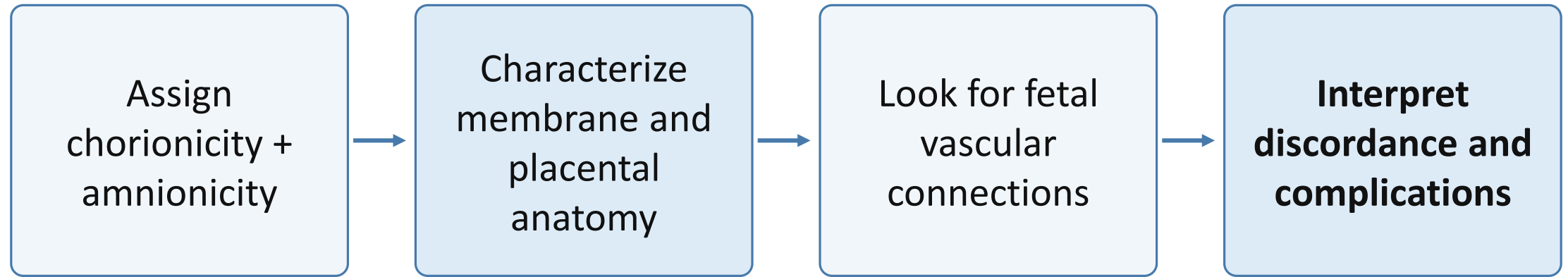
A TTTS pregnancy shows fluid discordance and the donor bladder is not visualized; No more advanced criteria are described. What stage fits?

Quintero stage II.

Absent donor bladder is the defining stage-II finding.

Doppler assessment remains essential.

Interpretation workflow: From pattern to risk



Do not diagnose TTTS solely from twin size or a shared placental mass.

Rapid comparison: Which clue matters most?

Observation	Most informative inference
Thick septum with chorion	Dichorionic membranes
Thin two-amnion septum	Monochorionic diamniotic
No dividing septum in shared chorion	Monochorionic monoamniotic
Paired fluid imbalance in MCDA	Evaluate TTTS and Quintero stage

Four points to retain

- Zygosity, chorionicity and amnionicity describe different features
- Dichorionic discs can be fused; Disc number alone is insufficient
- Monochorionic placentas connect fetal circulations
- Preferential shunting can underperfuse a donor and overload a recipient

Primary reference

Robbins, Cotran & Kumar. Pathologic Basis of Disease. 11th ed. (2026).

Chapter 22: The Female Genital Tract. Gestational and Placental Disorders; Twin Placentas, p. 936.

Original diagrams throughout this lecture are editable schematics, not reproduced textbook figures.

Supplementary references

Khalil A, et al. ISUOG Practice Guidelines: role of ultrasound in twin pregnancy. *Ultrasound Obstet Gynecol*. 2025;65:253–276. doi:10.1002/uog.29166.

SMFM Consult Series #72. Twin-twin transfusion syndrome and twin anemia–polycythemia sequence. *AJOG*. 2024. doi:10.1016/j.ajog.2024.07.017.

Fitzgerald B. Histopathological examination of the placenta in twin pregnancies. *APMIS*. 2018;126:626–637. doi:10.1111/apm.12829.

RCPA Macroscopic Cut-Up Manual: Placenta—multiple gestation.