Ultrasound in Twins

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Disclosures

Jodi S. Dashe, MD

No Relevant Financial Relationships

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Learning Objectives

After completing this presentation, the learner will be able to discuss:

1. Sonographic characteristics that distinguish monochorionic from dichorionic twins
2. Complications unique to monochorionic twins
3. Evaluation for twin-twin transfusion syndrome
4. Ultrasound surveillance recommendations for monochorionic and dichorionic pregnancies

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Outline

- Twinning prevalence, associated morbidities
- Chorionicity and amnionicity
  - First trimester
  - Second and third trimesters
- Discordance and growth
- Complications unique to monochorionic twins
  - TTTS, TAPS, TRAPS, conjoined twins
- Surveillance recommendations

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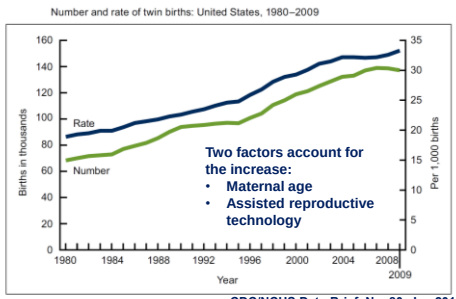
One in every 30 infants born in 2009 was a twin.



CDC/NCHS Data Brief, No. 80, Jan 2012.

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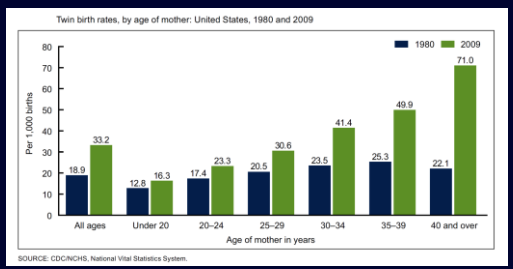
From 1980 to 2009, the age distribution of women giving birth to twins increased



CDC/NCHS Data Brief, No. 80, Jan 2012.

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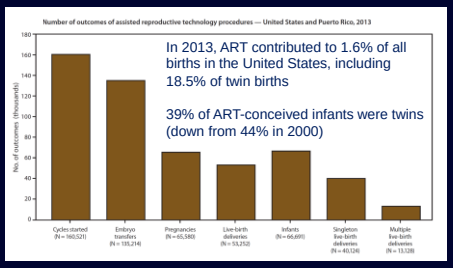
CDC Surveillance: Assisted Reproductive Technology in the United States



CDC/MMWR Surveillance Summary, Vol 64, No. 11, Dec 2015.

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Zygosity, Chorionicity, Amnionicity

Dizygotic twins

(2 oocytes/2 sperm)
~ 2/3 of twins

Always dichorionic
Always diamniotic

Monozygotic twins

(1 oocyte/1 sperm)
~ 1/3 of twins

If division ≤ 3 days, *morula* dichorionic diamniotic (~1/3)

If division 3-8 days, *blastocyst hatching* monochorionic diamniotic (~2/3)

If division 8-12 days, monochorionic monoamniotic

If division has not occurred by 13 days, conjoined twins

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Associated morbidities

- Twins are at increased risk for early loss, fetal death, preterm birth, low birthweight, neurological morbidity, and neonatal death
  - Monochorionic twins disproportionately affected
- Structural abnormalities:
  - 1:25 dichorionic twins
  - 1:15 monochorionic diamniotic twins
  - 1:6 monoamniotic twins

ISUOG Practice Guideline, Ultrasound Obstet Gynecol 2016;47:247-63.

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CDC: Births, Final Data for 2014

	Singletons	Twins
Preterm < 37 weeks	7.7%	58.7%
Preterm < 32 weeks	1.2%	10.6%
Low birthweight, < 2500 g	6.2%	55.2%
Very low birthweight, < 1500 g	1.1%	9.6%

National Vital Statistics Reports, Vol. 64, No. 12, Dec 2015.

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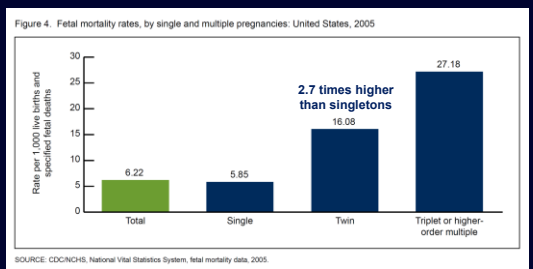
Fetal mortality (> 20 weeks) in singletons, twins, and triplets or higher order multiples, CDC 2005



CDC/NCHS Data Brief, No. 16, Apr 2009.

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Singleton and Twin Pregnancy Outcomes, Parkland Hospital, 2002-2012

	Singletons	Twins
Births	78,879	1700 (2%)
Stillbirths	406 5.1/1000	24 14.1/1000
Neonatal Deaths	253 3.2/1000	38 22.4/1000
Perinatal Deaths	659 8.4/1000	62 36.5/1000

Adapted from: Williams Obstetrics, 24th edition, McGraw Hill 2014.

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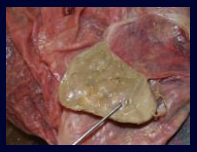
Loss of 1 twin

- "Vanishing twin" before 12 weeks
  - Reported in 36% of twin pregnancies and > 50% of triplets followed prospectively
- Fetus papyraceus observed after 12 weeks



Dickey RP et al, Am J Obstet Gynecol 2002;186:77-83.

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Loss of 1 twin

- Second- or third-trimester loss of one or both twins occurs in up to 5%
  - Co-twin loss occurs in 15% of monochorionic and 3% of dichorionic pregnancies
- In a monochorionic gestation, 15% to 20% of co-twins suffer neurological morbidity following demise of 1 twin
  - Immediate delivery is ***not*** beneficial in absence of another indication

Hillman SC, Obstet Gynecol 2011;118:928-40. Ong SS, BJOG 2006;113:992-8.
ACOG PB 144, Obstet Gynecol 2014;123:1118-32.

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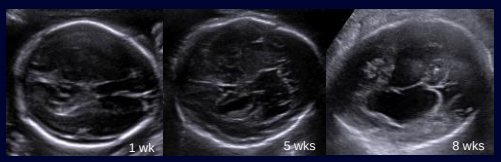
Neurological morbidity example

Development of intracranial hemorrhage with porencephaly after monochorionic co-twin demise



Immediate delivery is not beneficial unless other indication arises

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Chorionicity and amnionicity

- Diagnosis and evaluation of multiple gestation is considered an indication for first trimester sonography (NICHD, SMFM, AIUM, ACOG, ACR, SPR, SRU)
- Chorionicity assessment is at least 98% accurate in the 1st trimester
- Incorrect in up to 10% in 2nd trimester

Reddy U et al, Fetal Imaging Workshop, Obstet Gynecol 2014;123:1070-82.
Lee YM, Am J Obstet Gynecol 2006;195:863-7.
Blumenfeld Y et al (NICHD), J Ultrasound Med 2014;33:2187-92.

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Antenatal sonographic prediction of twin chorionicity

Young Mi Lee, MD,[a,*] Jane Cleary-Goldman, MD,[a] Harshwardhan M. Thaker, MD, PhD,[b] Lynn L. Simpson, MD[a]

American Journal of Obstetrics and Gynecology (2006) 195, 863–7

Chorionicity assessed sonographically ≤ 24 weeks in 410 twin pairs, 2001-2005, with postnatal pathology confirmation

Table I Statistical accuracy of antenatal prediction of monochorionicity

	Sensitivity (%)	Specificitiy (%)	PPV (%)	NPV (%)
Overall	88.9	97.7	92.6	96.5
1st trimester	89.8	99.5	97.8	97.5
2nd trimester	88.0	94.7	88.0	94.7

PPV, Positive predictive values; *NPV*, negative predictive values.

Chorionicity correctly assigned in 96%

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Accuracy of Sonographic Chorionicity Classification in Twin Gestations

- Secondary analysis of prospective trial by NICHD, 14 academic medical centers, 2004-2006
- 545 twin pairs, chorionicity assessed ≤ 20 weeks, postnatal pathology confirmation of placentation
- 17% monochorionic, 83% dichorionic
- Overall, sonographic assignment of chorionicity accurate in 94%
  - 1st trimester 95%
  - 2nd trimester 90%

Blumenfeld Y, et al (NICHD), J Ultrasound Med 2014;33:2187-92.

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Early first trimester

- Gestational sac number equals the number of chorions
- Dichorionic twins have a thick band of chorion separating 2 gestational sacs
- Monochorionic twins have a single sac
  - With monochorionic diamniotic twins, it may be difficult to visualize the thin intervening amnion before about 8 weeks

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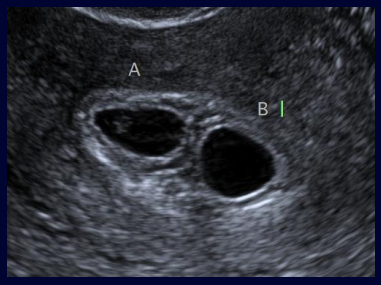
Dichorionic diamniotic twins at 6 weeks
Gestational sacs separated by thick band of chorion



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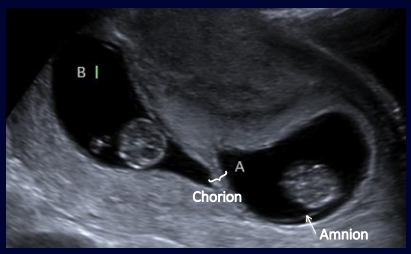
Dichorionic diamniotic twins at 9 weeks
Gestational sacs separated by thick band of chorion



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Dichorionic diamniotic twins at 10 weeks
Gestational sacs separated by thick band of chorion

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Monochorionic diamniotic twins at 8 weeks
Single gestational sac, amnion visible as a fine membrane encircling each embryo (arrows)

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Monochorionic diamniotic twins at 10 weeks
Single gestational sac, amnion visible as a fine membrane encircling each fetus (arrows)

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Monochorionic diamniotic twins at 10 weeks
Single gestational sac, amnion visible as a fine membrane encircling each fetus (arrows)

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Monochorionic twins - yolk sacs

- If intervening membrane is difficult to see, the number of yolk sacs *usually* equals the number of amnions
  - But, there are reports of diamniotic gestations with 1 yolk sac and of monoamniotic gestations with 2 yolk sacs!
- If cord entanglement, monoamnionicity
- If in doubt, perform follow-up sonography

Shen O, Ultrasound Obstet Gynecol 2006;27:53-5.
Corbett, Ultrasound Obstet Gynecol 2012;39:607-8.

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Most twins have 2 yolk sacs….

Monochorionic diamniotic twins at 8 weeks

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From late first trimester onward

- *Earlier is better*
- 4 categories of findings
  - Twin peak (λ) sign or T-sign
  - Number of placental masses
  - Thickness of dividing membrane
  - Fetal sex

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Twin peak (λ)- or T-sign

Twin peak or λ-sign: Wedge-shaped projection of placental tissue extending between layers of the inter-twin membrane and uterine wall in a dichorionic gestation

T-sign: Dividing membrane may form a "T" with the wall of the uterine cavity in a monochorionic diamniotic gestation

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Number of placental masses

- Dichorionic if 2 separate placental masses
  - Exception would be a bipartite monochorionic placenta (uncommon)
- Converse is not the case – single placenta does *not* indicate monochorionicity
  - 2 adjacent masses may look like 1
  - Additional findings are necessary

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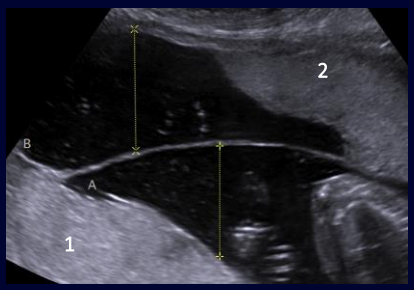
Number of placental masses



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Thickness of dividing membrane

- Membrane thickness is often > 2 mm with a dichorionic gestation
  - 2 layers of amnion and 2 of chorion
- Dividing amnion layers in a monochorionic gestation tend to look “wispy,” dichorionic membranes appear thicker
- Distinction more challenging with advancing gestation
- Not diagnostic as single criterion

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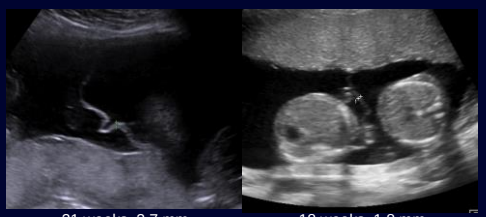
Membrane thickness examples



21 weeks, 2.7 mm
Dichorionic

18 weeks, 1.8 mm
Monochorionic

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Dichorionic diamniotic twins

- One or two placental masses (may be fused)
- Thick dividing membrane with twin-peak sign

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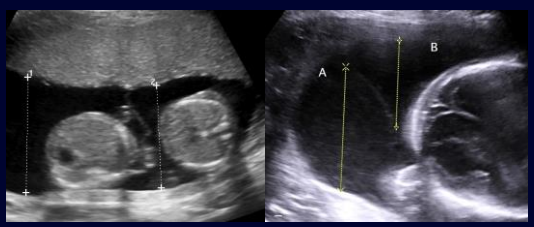
Monochorionic diamniotic twins

- Single placental mass
- Thin dividing membrane with T-sign



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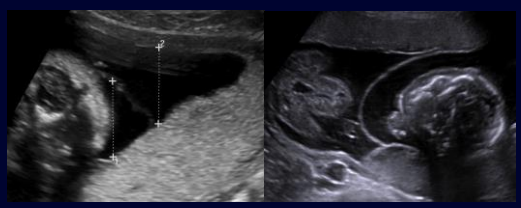
Monochorionic Dichorionic



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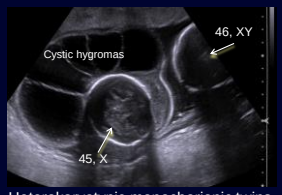
Fetal sex if visible

- Dichorionic twins same sex about ½ the time
- Monochorionic twins *almost always* same sex



Heterokaryotypic monochorionic twins

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Chorionicity isn't always easy!

How many fetuses are there?

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Quintuplets!

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Monoamniotic twins

- Incidence 1 per 10,000 pregnancies
  - About 5% of monochorionic twins
- Usually just 1 yolk sac
- Invariably associated with cord entanglement
  - When systematically sought, identified in 98%
  - Look with color Doppler whenever a dividing membrane cannot be visualized

ACOG PB 144, Obstet Gynecol 2014;123:1118-32.

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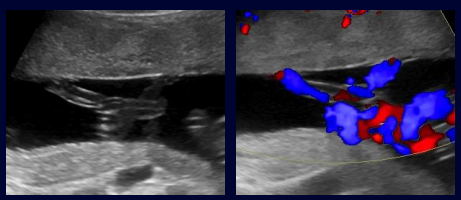
Monoamniotic gestation, 20 weeks



The umbilical cord insertion sites are in close proximity to one another, with no visible intervening membrane. Color Doppler demonstrates cord entanglement.

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Monoamniotic twins

- Overall survival 89%, survival of ≥ 1 twin 93%
- Increased risk for prematurity, abnormalities, TRAP sequence
- Many offer inpatient hospitalization with daily fetal surveillance from 24 to 28 weeks
  - Optimal management uncertain
- ACOG and ISUOG recommend delivery via cesarean at 32-34 weeks in absence of other complications

Rossi AC, Ultrasound Obstet Gynecol 2013;41:131.
ACOG PB 144, Obstet Gynecol 2014;123:1118-32.

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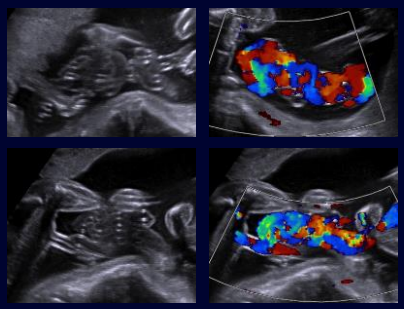
Monoamniotic gestation, 20 weeks



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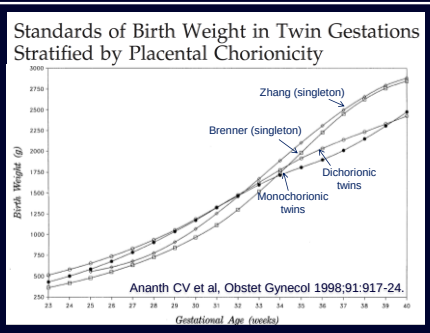
Twin growth



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Fetal growth restriction

- Usually defined using 10th percentile
- If singleton nomogram is used, such as Hadlock, prevalence will be higher than if a twin-specific or chorionicity-specific nomogram is used
- *Growth surveillance is recommended every 4 weeks, regardless of chorionicity*
- As in singletons, management is guided by factors other than fetal weight alone – such as gestational age, amniotic fluid, Doppler findings, or other antepartum surveillance findings

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Discordance

- Difference in fetal weight (or birth weight) between larger and smaller twins, expressed as % of weight of the larger twin
  - Rationale: assuming normal size of the larger twin, may indicate abnormal growth of smaller twin
- Typically defined as $\geq$ 20% (ACOG) or $\geq$ 25% (ISUOG)

ACOG Practice Bulletin No. 144, Obstet Gynecol 2014;123:1118-32.
ISUOG Practice Guideline, Ultrasound Obstet Gynecol 2016;47:247-63.

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Fetal weight discordance

- *"Whether growth discordant multifetal gestations – without a structural anomaly, aneuploidy, discordant infection, oligohydramnios, or fetal growth restriction – are at increased risk of adverse outcomes is debatable."* - ACOG
- Combination of discordance and growth restriction is associated with increased risk for perinatal morbidity

ACOG Practice Bulletin No. 144, Obstet Gynecol 2014;123:1118-32.

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Selective fetal growth restriction

- Fetus with estimated weight below 10th percentile and discordance $\geq$ 25%
- Dichorionic twins generally managed as singletons with FGR
- In monochorionic twins, limited evidence to guide management
  - sFGR believed to occur mainly due to unequal sharing of the placental mass and vasculature

ISUOG Practice Guideline, Ultrasound Obstet Gynecol 2016;47:247-63.

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Selective fetal growth restriction

- Gratacos (USOG 2007;30:28-34) has proposed staging sFGR according to smaller MC twin umbilical artery Doppler flow
  - I: Positive end-diastolic flow
  - II: Absent or reversed end-diastolic flow
  - III: Intermittent absent/reversed end-diastolic flow

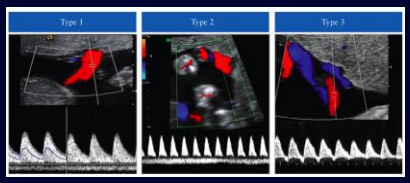

Image from: ISUOG Practice Guideline, Ultrasound Obstet Gynecol 2016;47:247-63.

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Complications unique to monochorionic twins

- Twin-twin transfusion syndrome
- Twin-anemia polycythemia sequence
- Twin-reversed arterial perfusion sequence
- Conjoined twins

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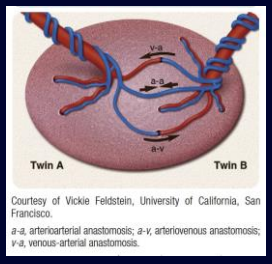
Twin-twin transfusion syndrome



Courtesy of Vickie Feldstein, University of California, San Francisco.

a-a, arterioarterial anastomosis; *a-v*, arteriovenous anastomosis; *v-a*, venous-arterial anastomosis.

Society for Maternal-Fetal Medicine. Am J Obstet Gynecol 2013;208:3-18.

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Twin-twin transfusion syndrome

- 1-3/10,000 births, up to 10% of MC twins
- Diagnostic criteria
  - Monochorionic diamniotic twin gestation
  - Hydramnios in one sac (> 8 cm pocket) and oligohydramnios in other sac (< 2 cm pocket)
- Blood is transferred from donor twin to recipient through placental arterio-venous anastemoses

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Twin-twin transfusion syndrome

- Surveillance: Sonography should be considered every 2 weeks from 16 weeks onward in all monochorionic twins to evaluate amniotic fluid and fetal bladders
- Quintero staging is recommended if TTTS is diagnosed

ACOG Practice Bulletin No. 144, Obstet Gynecol 2014;123:1118-32.
Society for Maternal-Fetal Medicine. Am J Obstet Gynecol 2013;208:3-18.

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Quintero staging system

I. Oligohydramnios in donor twin sac, hydramnios in recipient sac
II. Urine no longer visible within bladder of donor twin
III. Critically abnormal Doppler studies of umbilical artery, umbilical vein, or ductus venosus
IV. Hydrops of either twin
V. Demise of either twin

Quintero RA et al. J Perinatol 1999;19:550-5.

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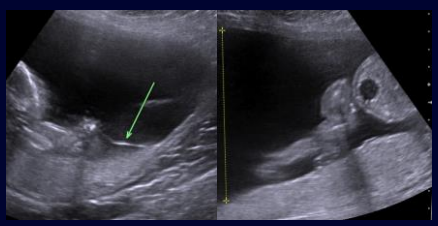
Stage I TTTS – 16 weeks



Oligohydramnios of donor twin sac
Hydramnios of recipient twin sac

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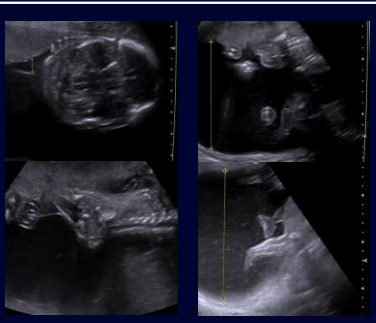
Stage I TTTS – 19 weeks



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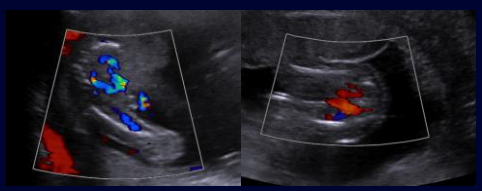
Stage II TTTS – 17 weeks



No urine visible in fetal bladder
(donor twin)

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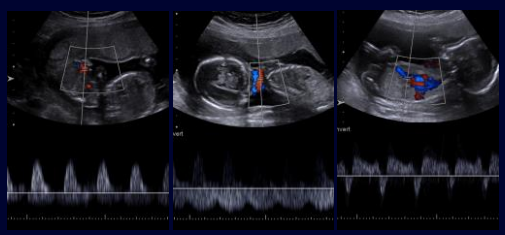
Stage III TTTS – 23 weeks



Umbilical artery
Absent end-diastolic flow

Umbilical vein
Pulsatile flow

Ductus venosus
Reversed a-wave flow

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Additional sonographic risk factors

First- and second-trimester sonographic findings associated with twin-twin transfusion syndrome

First-trimester findings
- Crown-rump length discordance[43]
- Nuchal translucency >95th percentile[42,44] or discordance >20% between twins[45,46]
- Reversal or absence of ductus venosus A-wave[47,48]

Second-trimester findings
- Abdominal circumference discordance[43]
- Membrane folding[28,42]
- Velamentous placental cord insertion (donor twin)[28]
- Placental echogenicity (donor portion hyperechoic)[49]

SMFM. Twin-twin transfusion syndrome. Am J Obstet Gynecol 2013.

Society for Maternal-Fetal Medicine. Am J Obstet Gynecol 2013;208:3-18.

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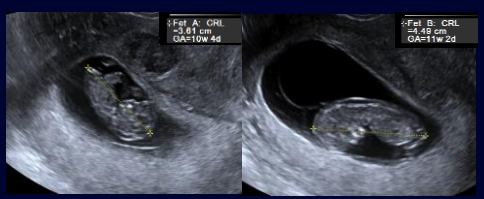
First trimester CRL discordance



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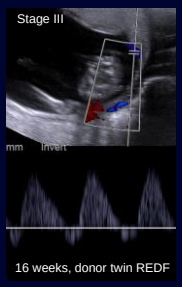
Enlarged nuchal translucency (progressed to severe TTTS)



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Membrane folding


18 weeks


28 weeks

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TTTS natural history

- Data limited
- Stage I: > 75% of cases remain stable or regress without invasive interventions, reported perinatal survival about 86%
  - Progression confers poor prognosis
- Stage III or greater: Perinatal loss rate 70-100%, particularly when TTTS presents before 26 weeks

Society for Maternal-Fetal Medicine. Am J Obstet Gynecol 2013;208:3-18.

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TTTS management

- For stages II, III, and IV, most consider fetoscopic laser photocoagulation to be the best available approach
  - However, meta-analysis data have not demonstrated survival benefit, neurologic outcome in Eurofetus trial not different than in controls
- Laser-treated TTTS is associated with 30-50% risk of perinatal death and 5-20% risk of neurologic handicap

Society for Maternal-Fetal Medicine. Am J Obstet Gynecol 2013;208:3-18.

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Twin-anemia polycythemia sequence (TAPS)

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TAPS

- Characterized postnatally by hemoglobin difference between monochorionic twins
- Diagnosed prenatally based on MCA peak systolic velocity difference (elevated in anemia)
- May occur in up to 5% of monochorionic twins
  - *Role of surveillance has yet to be determined*
- More common in TTTS – 13% following laser photocoagulation of placental anastemoses
- Staging has been proposed

Lopriore E, et al. Prenat Diagn 2010;30:251-55.
Slaghekke F, et al. Fetal Diagn Ther 2010;27:181-190.

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ISUOG Practice Guidelines: role of ultrasound in twin pregnancy

Ultrasound Obstet Gynecol 2016; **47**: 247–263

Stage	*Antenatal staging*	*Postnatal staging: intertwin Hb diff (g/dL)*
1	Donor MCA-PSV > 1.5 MoM and recipient MCA-PSV < 1.0 MoM, without other signs of fetal compromise	> 8.0
2	Donor MCA-PSV > 1.7 MoM and recipient MCA-PSV < 0.8 MoM, without other signs of fetal compromise	> 11.0
3	Stage 1 or 2 and cardiac compromise in donor (UA-AREDF, UV pulsatile flow, or DV increased or reversed flow)	> 14.0
4	Hydrops of donor twin	> 17.0
5	Death of one or both fetuses, preceded by TAPS	> 20.0

Lopriore E, et al. Prenat Diagn 2010;30:251-55.
Slaghekke F, et al. Fetal Diagn Ther 2010;27:181-190.

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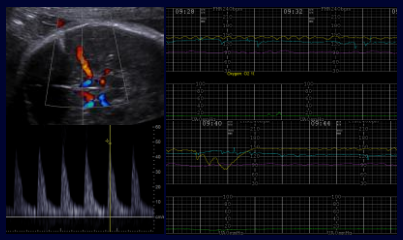
TAPS example

25 weeks, presents with suspected TTTS, ROM….



MCA PSV: A 0.93 MoM, B 1.55 MoM
Postnatal hemoglobin: A 21.1 g/dL, B 8.3 g/dL

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Twin-reversed arterial perfusion sequence (TRAPS)

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TRAPS

- Complicates approximately 1:35,000 pregnancies
  - About 1% of MC twins
- Morphologically-normal "pump" twin and an "acardius" – a recipient with complete or partial absence of the heart and other abnormalities
  - *Acardius anceps: complete absence of heart but at least partial presence of other structures*
  - *Acardius acephalus: absence of head and heart*
  - *Acardius amorphous: no recognizable structure*

Napolitani FD, Schreiber I. Am J Obstet Gynecol 1960;80:582-9.

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TRAPS

- Umbilical Doppler evaluation demonstrates pulsatile flow moving toward the acardiac twin, presumed due to large A-A and V-V anastomoses within placenta
- Deoxygenated blood from the pump twin flows in a reversed direction through the acardius
  - The lower body of the acardius is more likely to develop
- The pump twin has the burden of perfusing the acardiac twin and is at risk for hydrops from high-output cardiac failure

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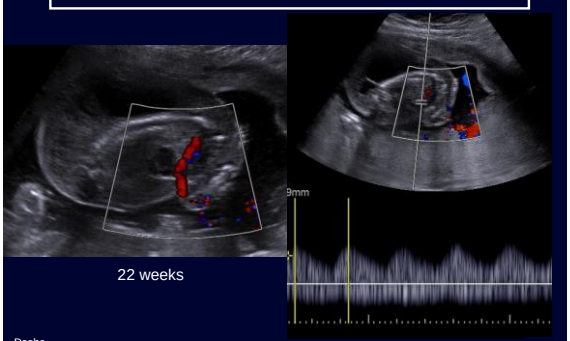
TRAPS



22 weeks

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TRAPS

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TRAPS

- Historically associated with > 50% mortality due to high-output cardiac failure or prematurity
- Risk is directly related to size of acardius
  - Ellipsoid volume estimate, L x W x H x π/6
- NAFTNet Review, 98 RFA cases 1998-2008
  - RFA performed at 20.2 ± 2.4 wks
  - Acardius to pump-twin ratio averaged 90%
  - 80% survival to 30 days (16 fetal losses, 4 NND)

Lee H et al. Fetal Diagn Ther 2013;33:224-9.

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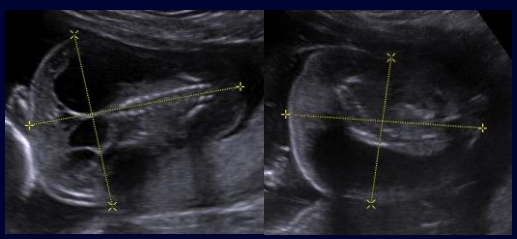
TRAPS



22 weeks, 9 x 11 x 7 cm acardius,
treated with radiofrequency ablation

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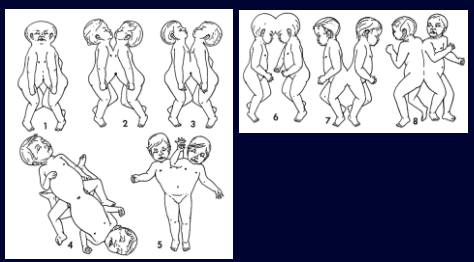
Conjoined twins



Spencer R, J Pediatr Surg 1996;31(7):941-4.

Dashe

Conjoined twins

- Estimated prevalence 1:70,000 births
- Monozygotic twins, do not fully separate by 12 days post-fertilization, continue to develop
- Term "Siamese" from Eng and Chang Bunker (1811-1874), joined at lower thorax
- In a review of 21 international surveillance programs (1968-2006), 50% were liveborn, 25% stillborn, and 25% were terminated

Mutchinick OM et al. Am J Med Genet 2011;157(C):274-287.

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Conjoined twins

Types	Definitions
Cephalopagus	There are two faces and are joined from the top of the head to the umbilicus
Thoracopagus	Are joined face-to-face from the upper thorax to the upper part of the abdomen and always involve the heart
Omphalopagus	The fusion includes the umbilicus region frequently at the lower thorax, but never the heart
Ischiopagus	The union usually includes the lower abdomen and duplicated fused pelvic bones, and external genitalia and anus are always involved
Parapagus	Are laterally joined, regularly share the pelvis. Varieties of parapagus conjoined twins are parapagus dithoracic (separated thoraces), parapagus dicephalus (one trunk two separate heads), and parapagus diprosopus (one trunk, one head, and two faces)
Craniopagus	Joined by the skull, share meninges but rarely the brain surface and do not include the face and trunk
Pygopagus	Are dorsally fused sharing the perineal and sacrococcygeal areas, has only one anus but two rectums
Rachipagus	Dorsally fused, the defect may involve the dorsolumbar vertebral column and rarely the cervical vertebrae and the occipital bone
Other symmetrical	Includes CT that some authors classify differently and also a variety of rare types of symmetrical CT
Asymmetric	Parasitic CT and fetus in fetus

Mutchinick OM et al. Am J Med Genet 2011;157(C):274-287.

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Conjoined twins

- Characterization of fused organs and associated anomalies is particularly important for prognosis
- Thoracopagus twins are the most common, and in 90% there is a shared pericardium, almost always associated with cardiac fusion
  - Typically precludes surgical separation

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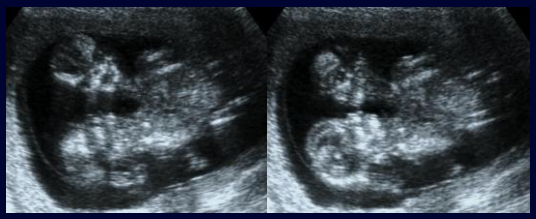
Conjoined twins



Thoracopagus twins at 13 weeks

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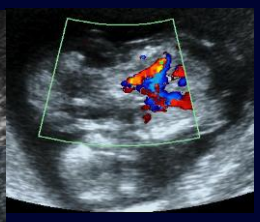
Conjoined twins



Thoracopagus twins at 13 weeks, demonstrating shared heart, anasarca

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Conjoined twins

Parapagus dicephalus (anencephalus) twins at 17 weeks

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Twin Sonography Recommendations

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First trimester sonography

Gestational age	Indication	Comment
7-10 weeks (ideally)	Gestational age assessment	
11-14 weeks	Nuchal translucency	Increased with aneuploidy, anomalies, TTTS
Earlier is better!	Evaluation of chorionicity	

Reddy U et al, Fetal Imaging Workshop, Obstet Gynecol 2014;123:1070-82.
(Guidelines from NICHD, SMFM, AIUM, ACOG, ACR, SPR, SRU)

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Second trimester - Dichorionic

Gestational age	Indication	Comment
18-20 weeks	Detailed evaluation of anatomy and placenta	
24 weeks onward	Every 4 weeks to assess growth	If discordant or other complication, may need more frequent evaluation

Reddy U et al, Fetal Imaging Workshop, Obstet Gynecol 2014;123:1070-82.

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Second trimester – Monochorionic

Gestational age	Indication	Comment
16 weeks onward	Every 2 weeks to assess amniotic fluid and fetal bladders	Largest vertical pocket 2 to 8 cm is normal
16 weeks onward	Every 4 weeks to assess growth	If discordant or other complication, may need more frequent evaluation
18-22 weeks	Detailed evaluation of anatomy and placenta, fetal echocardiography	Cardiac anomaly in 5%, up to 8% if TTTS is present

Reddy U et al, Fetal Imaging Workshop, Obstet Gynecol 2014;123:1070-82.
Emery SP, et al ,NAFTNet consensus, Obstet Gynecol 2015;125(5):1236-43.

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Doppler

Indication	Vessel	Comment
Monoamniotic twins, for diagnosis (cord entanglement)	Umbilical cord	Cord entanglement may not affect prognosis
Twin-twin transfusion (diagnosed)	- Umbilical artery/vein and ductus venosus - MCA	- Stage III criteria - TAPS surveillance
FGR (diagnosed)	Umbilical artery	As for singletons
Other surveillance [Controversial]	Umbilical artery or MCA	Not specifically recommended unless an indication arises

Reddy U et al, Fetal Imaging Workshop, Obstet Gynecol 2014;123:1070-82.
Society for Maternal-Fetal Medicine. Am J Obstet Gynecol 2013;208:3-18.

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Conclusions

- Approximately 1/3 of twins are monozygotic
  - Of monozygotic twins, 2/3 are monochorionic
  - Overall, about 20% of twins are monochorionic
- Early sonography is best for chorionicity assessment
  - Accuracy up to 98% in the 1st trimester
    - Look at number of sacs, intervening chorion
    - Usually, yolk sac number reflects amnionicity
  - Accuracy about 90% in the 2nd trimester
    - λ-sign or T-sign, placental masses, thickness of dividing membrane, fetal sex

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Conclusions

- Monochorionic twins are at increased risk for abnormalities and specific complications
  - Monoamniotic twinning (cord entanglement), TTTS, TAPS, TRAPS, conjoined twinning
- Sonography is recommended in the 1st trimester
- Sonographic is recommended every 4 weeks to assess growth in 2nd and 3rd trimesters
  - TTTS surveillance is recommended every 2 weeks in MC twins, starting at 16 weeks

Dashe

Key References

Multifetal gestations: twin, triplet, and higher-order multifetal pregnancies. Practice Bulletin No. 144. American College of Obstetricians and Gynecologists. Obstet Gynecol 2014;123:1118-32.

Khalil A, Rodgers M, Baschat A, Bhide A, Gratacos E, Hecher K, et al. ISUOG Practice Guidelines: role of ultrasound in twin pregnancy. Ultrasound Obstet Gynecol 2016;47:247-63.

Emery SP, Bahtiyar MO, Dashe JS, Wilkins-Haug LE, Johnson A, Paek BW, et al. The North American Fetal Therapy Network consensus statement: prenatal management of uncomplicated monochorionic gestations. Obstet Gynecol 2015;125(5):1236-43.

Society for Maternal-Fetal Medicine, Simpson LL. Twin-twin transfusion syndrome. SMFM Clinical Guideline. Am J Obstet Gynecol 2013;208(1):3-18.

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