Terrible Twos: Why Chorionicity Matters

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I HAVE NO RELEVANT FINANCIAL RELATIONSHIPS TO DISCLOSE.

SRU Educational Objectives

• Review classic imaging findings

• Illustrate ultrasound imaging methods and pitfalls in interpretation

• Critique new imaging technologies and determine how they may be successfully integrated into the clinical setting.

CHORIONICITY
Gestational sac = chorionic sac

Yolk sac is visible BEFORE amnion; used as a "surrogate" for number of amnions

Chorion and Amnion

Multiple gestations

• Dizygotic in 2/3rd
• Monozygotic in 1/3rd

25% dichorionic
75% monochorionic diamniotic
< 1% monoamniotic

Timing is everything!

• When the split occurs on
  – Day 1-3: Two of everything so dichorionic
  – Day 4-8: One chorion but 2 amnions
  – Day 9-13: One chorion, one amnion, two embryos
  – After day 13: one embryo tries to split

• Conjoined twins

Dichorionic
5.5 weeks

Yolk sac is visible BEFORE amnion; used as a “surrogate” for number of amnions
MUST FOLLOW UP TO CONFIRM AMNIONICITY

How many embryos?
WHAT IF TWINS DIAGNOSED AFTER FIRST TRIMESTER?

Chorionicity beyond the first trimester

- Fetal gender
  Different genders = dizygotic
- Number of placetas

Dichorionic (thick membrane)

Monochorionic diamniotic (thin membrane)
Twin Peak Sign

Chorionicity beyond the first trimester

- Fetal gender
  - Different genders = dizygotic
- Number of placentas
- Membrane thickness
- Twin peak sign
  - 94% sensitivity for prediction of dichorionicity when seen
  - Absence does not exclude dichorionicity

WHY DO WE CARE ABOUT CHORIONICITY?

Chorionicity and outcome

- Prognosis for two live births with two live embryos at 8wks
  - Dichorionic
    - Normal scan 89%
    - Abnormal scan 62%
  - Monochorionic
    - Normal scan 58%
    - Abnormal scan 21%

Monochorionic losses attributed to TTTS and unequal placental sharing

Monoamniotic losses attributed to high rate of anomalies and to cord entanglement

Monochorionic
- Loss rate 14-24 weeks
  - Monochorionic = 10 x dichorionic
- Loss rate after 24 weeks
  - Monochorionic = 3 x dichorionic

Loss rate prior to 24 weeks was 8.9% in first 5 yrs. of STORK study
Decreased in to 4.9% in second 5yrs
NO CHANGE in loss rate after 34 weeks

TWIN TWIN TRANSFUSION SYNDROME

Twin twin transfusion syndrome

- Placental anastomoses result in arteriovenous shunt
  - 10-20% monochorionic pregnancies
- Donor (pump) twin
  - sends blood to co-twin instead of to placenta
  - causing high output
- Recipient twin
  - gets “extra” blood from co-twin

Donor twin: High output

- Sends blood to co-twin instead of to placenta
  - “pumping” up co-twin
  - Less blood to placenta
  - = less coming back
  - = oligemia
  - = decreased renal perfusion
  - = oligohydramnios

Recipient twin: Volume overload

- Gets “extra” blood from co-twin = volume overload
  - which may cause cardiomyopathy
- Lots of blood to kidneys
  - = lots of urine
  - = polyhydramnios

Oli-poly

- Oligohydramnios
  - MVP < 2cm
- Polyhydramnios
  - MVP > 8cm (USA)

Amniotic fluid difference > 4cm was associated with significant increased risk of TTTS development

Prediction of TTTS with Amniotic Fluid Discordance. Fetal Diagn Ther 2013;34:8–12

TTTS

- Where is the membrane?
- Stuck twin

TTTS

- Twin A
- Twin B
TTTS
- ~10% monochorionic pregnancies
  - 30% twins are monozygotic
  - 70% of those are monochorionic
- Progressive
  - 70-100% mortality
  - If advanced, early presentation
  - Most fetuses now expected to survive
- Laser coagulation of placental vessels is the treatment of choice

Growth monthly
Fluid check + AC
2/52 intervals


Checklist if you can’t see a membrane
- Technical?
- Monoamniotic?
- Ruptured?
- PROM of one twin
- Anhydramnios in one twin
- TTTS?

TWIN REVERSED ARTERIAL PERFUSION

TRAP
- Placental anastomoses result in A-A shunting
  - ~1% monochorionic twins
- Pump twin high output
- Recipient twin
  - perfused with co-twin’s deoxygenated blood
  - blood flow into fetus via arteries i.e. UA to internal iliacs to lower extremities

Acardiac arterial anastomotic vessel
TRAP

3 weeks later...

Another 3 weeks later...

• The term twin reversed arterial perfusion explains the pathology of this condition. Rudimentary heart formation can occur. The anatomy of the reverse-perfused twin is highly variable.
  • Check the direction of flow in the umbilical artery in every anomalous twin and you won’t miss this diagnosis.
  • The reverse-perfused twin cannot survive so the focus of management is on saving the pump twin.
  • Untreated pump twin mortality is 35-75%.

Twin Reversed Arterial Perfusion

  • “Recipient” twin
    – Cannot survive
    – Acts as “leech” for pump twin
  • Treatment is to isolate the TRAP fetus
  • Returns pump twin to singleton physiology

Van Allen et al 1983

DON’T FORGET

**TTTS**
Combination of oligohydramnios in one sac and polyhydramnios in the other.

**TRAP**
Check direction of umbilical artery flow in ANY abnormal twin.

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**TWIN DEMISE**

**Twin Demise: Monochorionic**
- “Twin embolization syndrome”
  - dead twin embolizes live twin???
- Acute hypotensive episode in survivor
  - brain
  - kidneys
  - heart

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**Brain Injury**

- November 23rd
- December 1st

**Myocardial Injury**

- November 23rd
- December 1st

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**MONOAMNIOTIC**
Monoamniotic Twins

- Malformations in 10-26%
- Heart defects in 4%
- All risks of MC twins
- Growth discordance
- Cord accidents

With modern aggressive management PNM decreased from 30-50% to 10-20%

In ongoing pregnancies, daily fetal monitoring and serial growth scans are initiated at viability, which often involves hospitalization at 24–28 weeks gestation in order to facilitate twin surveillance.

Monoamniotic surveillance

Conclusion based on study of 193 MA twin pregnancies:

The in utero risk of a monoamniotic twin fetus exceeds the risk of a postnatal non-respiratory complication at 32 4/7 weeks of gestation. If close fetal surveillance is instituted after 26-28 weeks of gestation and delivery takes place at approximately 33 weeks of gestation, the risk of fetal or neonatal death is low, no matter the surveillance setting. Respiratory complications were considered “manageable”


Specific monoamniotic twin risk

- Malformations in 10-26%
- Heart defects in 4%
- All risks of MC twins
- Growth discordance
- Cord accidents

Perinatal loss per 2 week interval
- 2.4% from 15-32 weeks
- 3.1% from 33-36 weeks
- 21.9% from 36-38 weeks

Most centers deliver between 32 and 34 weeks

But cord entanglement isn’t easy to prove as the cause of death

Monoamniotic surveillance

HIGHLY controversial!!

Inpatient vs outpatient
If inpatient when to admit
Continuous monitoring vs intermittent
Scan weekly, twice weekly, daily?
Role of Doppler?

Cord knot


Umbilical Cord Insertion

- Central
- Eccentric
- Marginal
- Velamentous

Cord inserted within 2 inches of placental margin.

Cord inserts onto membranes, unprotected umbilical vessels run in membranes to reach the placenta.
Always document placental position, location and umbilical cord insertion

**Central cord insertion**

**Velamentous Cord**

- More frequent in MCDA twins
- Increased likelihood of
  - TTTS
  - Unequal placental sharing
  - Discordant twin growth
  - Selective IUGR
- PNM increased x 3 in MC twins with velamentous cord

**Vasa previa**

Vasa previa is a critical finding
It is an indication for Cesarean delivery prior to the onset of labor
- Patients are given steroids at 28-32 wks.
- Most admitted to tertiary care facility at 30-32 wks.
- Immediate C-section if any bleeding

**Vasa Previa**

**Summary of risks in multiple gestation**

- FGR/discordant growth
- Preterm delivery
- Monochorionic issues
  - TTTS
  - TRAP
  - Consequences of demise
  - Cord entanglement in monoamniotic twins
- Anomalies
  - Twins ~1.5% of births
  - 10% of perinatal morbidity and mortality
  - Anomalies seen 25% twins dying in utero
  - 0.3% singletons
  - Concordant in only 15% of monzygotic
  - 2 to 3 x singleton rate in USA

FGR: fetal growth restriction
Now preferred terminology rather than intrauterine growth retardation
Multiple pregnancy “to do” list

- Check chorionicity
- Check amnionicity
- Check placental cord insertion
- Look for anomalies
  - If present, check direction of flow in UA
  - Normal is toward the placenta
- Monitor growth
  - Monthly at least
- Monitor fluid
  - Every 2 wks or more
- Check cervical length at ~24 weeks
  - Make sure no vasa previa