The Trouble with Twins

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The Texas Fetal Center
Children’s Memorial Hermann Hospital
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Multiple Gestation
Overview

- Incidence
- Embryology
- Perinatal morbidity
- Chorionicity
- Single demise
- Twin-twin transfusion
- Single IUGR
- Anomalies
- TRAP sequence
- Monoamniotic twins
- Short cervix
Incidence
2010 CDC data: 1 in 30 pregnancies
132,562 twin pregnancies

2009 Embryo Transfer Guidelines

**Recommended Limit on the Number of Cleavage Stage Embryos to Transfer**

<table>
<thead>
<tr>
<th>Prognosis</th>
<th>Age &lt; 35</th>
<th>Age 35-37</th>
<th>Age 38-40</th>
<th>Age 41-42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable*</td>
<td>1-2</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>All others</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

**Recommended Limit on the Number of Blastocysts to Transfer**

<table>
<thead>
<tr>
<th>Prognosis</th>
<th>Age &lt; 35</th>
<th>Age 35-37</th>
<th>Age 38-40</th>
<th>Age 41-42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable*</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>All others</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*Favorable = first cycle of IVF, good embryo quality, excess embryos available for cryopreservation, or previous successful IVF cycle.
Embryology
Multiple Gestation
Embryology

- Dichorionic diamniotic
- 74% of twins
- Split on day #1 – 3
Multiple Gestation Embryology

- Monochorionic, diamniotic
- Split on day 3 - 8
- 25% of twins
Multiple Gestation
Embryology

- Monochorionic, monoamniotic
- Split on day 8 - 10
- 1% of twins

Monozygotic
(Monochorionic, Monoamniotic)
Multiple Gestation
Embryology

• Monochorionic, monoamniotic
• “Conjoined”
• Split after day 13
• 1:25,000
Morbidity
# Multiple Gestation Morbidity/Mortality

<table>
<thead>
<tr>
<th></th>
<th>Twins</th>
<th>Triplets</th>
<th>Quadruplets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gest Age @ delivery (wks)</td>
<td>35.3</td>
<td>32.2</td>
<td>29.9</td>
</tr>
<tr>
<td>Birth weight (gr)</td>
<td>2347</td>
<td>1687</td>
<td>1309</td>
</tr>
<tr>
<td>Cerebral palsy</td>
<td>↑ 5X</td>
<td>↑ 17X</td>
<td>?</td>
</tr>
<tr>
<td>Long-term neuro problem</td>
<td>3.7%</td>
<td>8.7%</td>
<td>11.1%</td>
</tr>
<tr>
<td>At least 1 handicapped infant</td>
<td>7.4%</td>
<td>20%</td>
<td>50%</td>
</tr>
<tr>
<td>Infant death of ≥ 1 baby</td>
<td>2.4%</td>
<td>6.3%</td>
<td>7.8%</td>
</tr>
</tbody>
</table>

There is NO diagnosis of twins
Multiple Gestation Guidelines

Society for Maternal-Fetal Medicine

“All women with a twin pregnancy should be offered an ultrasound examination between 10-13 weeks of gestation to assess viability, chorionicity, crown-rump length, and nuchal translucency”

SMFM, Simpson L. Am J Obstet Gynecol 2013;208:3-18
Multiple Gestation

Chorionicity

Lambda sign

Dichorionic Placenta
Multiple Gestation
Chorionicity

Monochorionic Placenta

T sign
Multiple Gestation
Chorionicity

10 - 14 weeks gestation

“T” sign
Monochorionic

Twin Peak (lambda)
Dichorionic

UTHealth
The University of Texas
Health Science Center at Houston
Medical School

Texas Fetal Center

Children’s Memorial Hermann Hospital
How do you make identical twins?
Complications of Monochorionic Twinning
Multiple Gestation
Monochorionic Twins

• 30% of cases with complications
  – twin-twin transfusion
  – selective IUGR
  – intrauterine fetal demise
    ✓ 15% - IUFD of co-twin
    ✓ 26% - neurologic damage in co-twin

15% of cases
27% of cases
Multiple Gestation

Twin-Twin Transfusion

- Complicates 10% of MC twins
- One in 58 twin pregnancies
- One in 4,170 pregnancies
- Polyhydramnios (MVP > 8 cm with oligohydramnios (MVP<2)
- Smaller twin may not be IUGR
- If < 26 weeks = 90% perinatal mortality
Laser Photocoagulation

- 70% survival of 2
- 20% survival of 1
- 10% survival of none
Multiple Gestation
Selective IUGR

- 15% of monochorionic twins
- One twin with normal growth and amniotic fluid
- Second twin with IUGR and oligohydramnios
- Unequal placental sharing
Multiple Gestation Ultrasound Algorithm

10 – 13 week US for chorionicity

Dichorionic, diamniotic
- Anatomy scan @ 20 weeks
- Repeat growth US Q 4 weeks
- Delivery by 40 weeks

Monochorionic, diamniotic
- Start Q 2 week US’s for bladder and amniotic fluid assessment at 16 weeks EGA
- Alternate with Q 4 week US’s for growth
- Anatomy scan @ 20 weeks
- Start weekly BPP’s at 32 weeks
- Delivery by 35 – 37 weeks

Delivery by 40 weeks

Dichorionic, diamniotic
- Anatomy scan @ 20 weeks
- Repeat growth US Q 4 weeks
- Delivery by 40 weeks

Monochorionic, diamniotic
- Start Q 2 week US’s for bladder and amniotic fluid assessment at 16 weeks EGA
- Alternate with Q 4 week US’s for growth
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- Start weekly BPP’s at 32 weeks
- Delivery by 35 – 37 weeks
Multiple Gestation Ultrasound Algorithm (TTTS)

MCDA twins with MVP > 8 cm and MVP < 2 cm

Dopplers of UA, UV, ductus venosus in both twins

- All normal
  - Assess donor bladder
    - Present: Stage I disease
      - Repeat assessment in 1 week
    - Absent: Stage II disease

- Any abnormal
  - Stage III disease
    - Referral to fetal center for counseling and treatment (laser @ 16 – 25 6/7 weeks; selective reduction)
  - Hydrops: Stage IV disease
  - Death of one twin: Stage V disease

Stage IV and V diseases are not described in the given text.

Children's Memorial Hermann Hospital

The University of Texas Health Science Center at Houston Medical School

Texas Fetal Center
Assessment of Fetal Growth
Multiple Gestation Assessment of Growth

• Usually defined as > 20% difference in estimated fetal weight

• Assumes larger twin is the “control”
  ✓ Example: Twin A at 70% and twin B at 30% would not indicate IUGR in twin B

• Need smaller twin to be < 10%

• Can use twin growth tables

• Look at trends in growth

• Abnormal UA Dopplers in MC twins can remain abnormal much longer than singletons
Anomalies
Multiple Gestation
Anomalies

- 845 pairs of twins w/evaluation of zygosity
  - 483 monozygotic
  - 252 dizygotic
  - 110 zygosity unconfirmed

- Anomalies
  - Singletons: 0.6%
  - DZ: 1% (100% discordant)
  - MZ: 2.7% (82% discordant)

Multiple Gestation Anomalies

• Risk of preterm delivery if affected twin develops polyhydramnios

• Risk of IUFD with death/neurologic sequelae in normal twin

• Methods:
  • Dichorionic twins: intracardiac KCL
  • Monochorionic twins
    ✓ Bipolar cautery
    ✓ Radiofrequency ablation
Multiple Gestation
Bipolar Cautery
Multiple Gestation

Radiofrequency Ablation

12 cm

17 g

2 cm
## Multiple Gestation Selective Reduction

<table>
<thead>
<tr>
<th></th>
<th>RFA (N = 17)</th>
<th>Bipolar (N = 34)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operative time</strong></td>
<td>31.8 ± 22</td>
<td>29.8 ± 22</td>
<td>0.78</td>
</tr>
<tr>
<td><strong>Type of anesthesia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV sedation</td>
<td>17</td>
<td>23</td>
<td>0.03</td>
</tr>
<tr>
<td>Spinal</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>General with ETT</td>
<td>0</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td><strong>PPROM</strong></td>
<td>1 (6%)</td>
<td>8 (24%)</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>Weeks gained</strong></td>
<td>13.8 ± 6.8</td>
<td>13.0 ± 5.6</td>
<td>0.71</td>
</tr>
<tr>
<td><strong>GA @ delivery</strong></td>
<td>34.4 ± 5</td>
<td>33.9 ± 5</td>
<td>0.78</td>
</tr>
<tr>
<td><strong>Survival (O/E)</strong></td>
<td>17/19 (90%)</td>
<td>31/36 (86%)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Roman et al. Ultrasound Obstet Gynecol 2010;36:37-41
Twin Reversed Arterial Perfusion Sequence (TRAP; acardiac twin)
Multiple Gestation
TRAP Sequence

- Incidence: 1/35,000 pregnancies
- 1% of monochorionic twins
- <20% with cardiac tissue present
- 50% mortality of the “pump” twin
Criteria for treatment:

• No longer based on size of acardiac/pump twin
• > 16 weeks EGA
• Acardiac growing
• Increased flow to acardiac on color flow Doppler
• Decreased resistance in cord flow to acardiac

83% Survival

Lee et al. Am J Obstet Gynecol 2008;199:S4
Monoamniotic Twins
NORMAL CORD

ENTANGLED CORD

F 0B 3C80 160 mm HIGH

05/29/91 16:36:42
Multiple Gestation
Monoamniotic Twinning

• Admit at viability: 24 – 26 weeks
• Antenatal steroids
• 2 – 3X daily fetal monitoring (continuous not practical)
• Delivery by Csection at 32 – 34 weeks’ gestation

Cervical Length
Multiple Gestation
Cervical Length

– Cervical length at 22 – 24 weeks
  – must be transvaginal
  – bladder empty
  – ↑ risk for preterm delivery by 4X

## Multiple Gestation
### Cervical Length

Transvaginal cervical length @ 22 – 24 weeks; median: 35 mm

<table>
<thead>
<tr>
<th>Cervical Length</th>
<th>Incidence</th>
<th>Delivery &lt; 32 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 25 mm</td>
<td>16%</td>
<td>35%</td>
</tr>
<tr>
<td>≤ 20 mm</td>
<td>8%</td>
<td>49%</td>
</tr>
<tr>
<td>≤ 15 mm</td>
<td>5%</td>
<td>67%</td>
</tr>
</tbody>
</table>

Multiple Gestation
Cervical Length

• Hospitalization for bedrest
• Cerclage
• Progesterone
## Multiple Gestation
### Hospitalization for Bedrest

### Gestational Age at Delivery

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Treatment</th>
<th>Control</th>
<th>Mean Difference</th>
<th>Weight</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean(SD)</td>
<td>N</td>
<td>Mean(SD)</td>
<td>IV,Fixed,95% CI</td>
</tr>
<tr>
<td>Crowther 1989</td>
<td>70</td>
<td>35.8 (1.9)</td>
<td>69</td>
<td>35.8 (1.9)</td>
<td>0.0 [-0.63, 0.63]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>70</td>
<td>69</td>
<td>100.0 %</td>
<td>0.0 [ -0.63, 0.63 ]</td>
<td>0.0 [ -0.63, 0.63 ]</td>
</tr>
</tbody>
</table>

### Perinatal Death

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Treatment</th>
<th>Control</th>
<th>Peto Odds Ratio</th>
<th>Weight</th>
<th>Peto Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n/N</td>
<td>n/N</td>
<td>Peto,Fixed,95% CI</td>
<td></td>
<td>Peto,Fixed,95% CI</td>
</tr>
<tr>
<td>Crowther 1989</td>
<td>2/140</td>
<td>2/138</td>
<td>0.99 [0.14, 7.07]</td>
<td>100.0 %</td>
<td>0.99 [0.14, 7.07]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>140</td>
<td>138</td>
<td>100.0 %</td>
<td>0.99 [0.14, 7.07]</td>
<td></td>
</tr>
</tbody>
</table>

Total events: 2 (Treatment), 2 (Control)

Crowther CC. The Cochrane Collaboration 2009
Multiple Gestation
Progesterone (all twins)

- 655 twins
- Weekly IM 17-OHP
- 16 – 35 weeks gest

## Multiple Gestation

### Cerclage for Short Cervix

Meta-analysis of 4 randomized trials

<table>
<thead>
<tr>
<th></th>
<th>Cerclage</th>
<th>No cerclage</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preterm birth &lt; 35 wks</td>
<td>73%</td>
<td>36%</td>
<td>2.15 (1.15–4.01)</td>
</tr>
<tr>
<td>Perinatal mortality</td>
<td>23%</td>
<td>6%</td>
<td>2.66 (0.83 – 8.54)</td>
</tr>
</tbody>
</table>

Multiple Gestation
Progesterone for Short Cervix

- Cx < 15 mm @ 22 weeks
- 1.7%
- 200 mg vag progesterone nightly

<table>
<thead>
<tr>
<th>Maternal Characteristic</th>
<th>Total No. of Patients</th>
<th>No. Delivering Spontaneously at &lt;34 Wk</th>
<th>P Value for Homogeneity</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>250</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Cervical length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;12 mm</td>
<td>125</td>
<td>44</td>
<td>0.25</td>
</tr>
<tr>
<td>12–15 mm</td>
<td>125</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥35 yr</td>
<td>46</td>
<td>18</td>
<td>0.93</td>
</tr>
<tr>
<td>&lt;35 yr</td>
<td>204</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Body-mass index</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥30.0</td>
<td>37</td>
<td>12</td>
<td>0.75</td>
</tr>
<tr>
<td>20.0–29.9</td>
<td>187</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>&lt;20.0</td>
<td>26</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>95</td>
<td>33</td>
<td>0.65</td>
</tr>
<tr>
<td>Black</td>
<td>137</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Obstetrical history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parous with ≥1 previous preterm birth</td>
<td>38</td>
<td>16</td>
<td>0.87</td>
</tr>
<tr>
<td>Parous with no previous preterm birth</td>
<td>72</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Nulliparous</td>
<td>140</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>No. of gestations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin</td>
<td>24</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Singleton</td>
<td>226</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

Take home points
Multiple Gestation
Take home points

• Determine chorionicity @ < 10 - 13 weeks’ gestation
• Treat monochorionic twins as **HIGH RISK**
• Ultrasound monochorionic twins every 2 weeks starting at 16 weeks
• Ultrasound dichorionic twins every 4 weeks
• Twin-twin transfusion can now be successfully treated between 16 – 26 weeks with laser therapy
• Fetal medicine has evolved to be able to treat many other complications of twins
Thank you