Delayed Interval Delivery

Is it reasonable *and* safe?

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Disclosures

- I have no relevant financial relationships to disclose or conflicts of interest to resolve.

- I will not discuss any unapproved or off label, experimental or investigational use of a product, drug, or device.
The arc of obstetric interventions

- An interesting case report
- More positive case reports
- A series of positive retrospective studies
- A note of caution
- A dissenting voice
- A disappointing prospective study
- A final equitable sensible approach?
A Case Report

- HG, a 27 yr old G4P2L2 at 21w6d is referred for TTTS.
- Twin A 61% MVP 12 cms reversed a wave flow in the DV
- Twin B <10% MVP 1cm
- Cervix 1.7 cms
- Diagnosis: TTTS Stage 3R
Day 2 9/21

- Admitted for laser
- 6 anastomoses ablated
- Solomonization performed
- 900 ml amnioreduction
- 42 minute procedure
- No complications
Day 3 9/22

- Day 1 post op
- Both babies alive and well
- TVUS shows cervix 2.5 cms long
- Discharged home
• 23 weeks
• Twin A MVP 1.8 cms
• Normal Dopplers
• Twin B MVP 5.6 cms
• Normal Dopplers
• Translabial US – no closed cervical length
• PPROM recipient twin

• PLAN:
  • Admit for amniopatch
  • PPROM antibiotics
  • Betamethasone
  • Neuroprophylactic magnesium after 24 weeks
Day 10 - 9/29

- 3 hours after admission spontaneous labor ensued
- Twin A delivered alive vaginally under spinal anesthesia
- Contractions stopped
- There was no bleeding
- After 30 minutes of observation the cord was tied with #1 monocryl X 2 and cut high
- The cervical canal and upper vagina were irrigated with normal saline and 5% Betadine
- A Shirodkar suture was placed using 5mm Mesiline tape
- The patient was placed on cefazolin, gentamicin and metronidazole as well as magnesium sulfate and a second dose of betamethasone given.
Day 11 – 9/30

- Twin B – AFI 16.5
- Normal Dopplers
- Cervix 4 cms long
Day 17 – 10/6
7 days interval

- Twin B 24 wks, EFW 562 gms
- AFI 16.2 cm
- Normal Dopplers
- Mom doing well – nl WBC and afebrile
- Translabial 3 cms
Day 24 – 10/13
14 days interval

- 25 weeks
- EFW 785 gms
- AFI 14.7 cms
- Cervix 2.5 cms
- Mom continues to feel well and remains afebrile with normal WBC
Day 28 – 10/17
18 days interval

- Increasing abdominal pain
- Uterine tenderness
- WBC 11 to 15.8
- Chorioamnionitis diagnosed
- CS
- 740 gm
- Arterial pH 7.34
- 2+ e coli on placental path
• Twin A – 23 weeks, 500 gms
  • Developed NEC at 26w1d and transferred to surgical center
  • Subsequent demise
• Twin B – 25w4d, 740 gms
  • Alive and well
Identical Twin Brothers Set to Have Birthdays Months Apart Due to Rare Delivery

welcomed their son Link on Sept. 29, according to officials from the Evergreen Health Medical Center. "It's very surreal to be post-partum and..."
Identical twins could be born 4 months apart in Kirkland

by Molly Shen | Tuesday, October 13th 2015
Even in Sweden

Här är förlossningen du inte trodde var möjlig
My life is complete

Identical twins will have birthdays in different months after one is born 18 days after his brother in miracle premature births

- Holli Gorveatt’s son Link was born weighing just 1lb 2oz on September 29
- But Gorveatt remained pregnant with his identical twin brother Logan
- On Saturday, Logan was born, meaning his birthday is in a different month
- He was delivered via C-section weighing just 1lb 10oz on October 17
- The babies were born after doctors performed in-utero surgery to repair a blood flow problem due to the fact they shared a placenta
First case report of delayed interval delivery (DID) by Corson in 1880 in the BMJ – uterine didelphys.

Between 1880 and the mid 1950’s there were sporadic case reports of similar occurrences of uterine didelphys pregnancies with intervals up to 56 days, occasionally despite attempts to deliver with pitocin.

In 1957 Abrams reported a DID in a normal uterus with a delay of 35 days. The first twin was 14oz and died soon after birth. The second twin was 2lbs 4ozs and survived. The mother did well.
Drucker et al reported in 1965 a 65 day DID in a normal uterus.

- Twin A was 375 gms and delivered at home after PPROM associated with fever and chills and died soon thereafter.
- She was admitted with a fever of 104 F and a pulse of 110 and a white count of 12,000.
- Pitocin was started and after little effect an abdominal X ray showed another fetus.
- Pitocin was stopped and antibiotics started. She came afebrile and was discharged after 6 days.
- 65 days later she delivered a 1390 gm fetus (outcome not mentioned)
- She subsequently had a prolonged septic course and was discharged with Aschemann’s syndrome.
Thomsen, 1978, reported a DID with the first mention of the use of a cerclage.

• 27 weeks PTL treated with ethanol. Transverse lie. Internal podalic version and delivery of a 690 gm infant who died soon after birth.
• 2 vertical and one horizontal Mersiline sutures were then placed under betamimetic tolocysis.
• Antibiotics, tocolytics and dexamethasone given.
• She subsequently went into labor at 31 weeks and was delivered of a 1192 gm infant who survived.
• No reported maternal morbidity.
• “Although the obstetric staff handling the delivery of twin B shared in the pleasure of the parents over the survival and apparent favorable condition of their infant son, it seems obvious that in a specialty known for unique clinical situations and even bizarre endings, an incidental favorable outcome does not in itself give proof that correct clinical approaches have been established”
1980’s

- A further 11 cases reported in the literature.
- Twins and triplets
- Intervals of 5-131 days between deliveries
- Half using cerclage, most using tocolysis and antibiotics
- 100% first twin death. 81% with second twin survival.
- Clearly some reporting bias…
1997 – 1st report of DID in DiMo pregnancy

- **Delayed interval delivery in a twin pregnancy with monochorionic placenta** Ernst Beinder, MD American Journal of Obstetrics and Gynecology 254 January 1997

- 23 week PPROM
- 24 week delivery 730 gms
- Antibiotics/tocolytics/cord transection/cerclage
- 34w5d delivery of 2260 gm female infant
- Both babies survived
- Placenta confirmed monochorionic by pathology
1998 – the first systematic review

- Delayed interval delivery in multifetal pregnancy – Porreco, Diss Sabin, Heyborne and Lindsay.
- 66 month retrospective review of a single practice (? years)
- 59 sets of twins or triplets delivered less than 30 weeks
- 43 not candidates for DID.
- 16 candidates for DID identified
- 9 DID attempted
Uniform technique

- High ligation of the umbilical cord
- Placenta left in situ
- Copious irrigation of the lower uterine segment with antibiotic solution (bacitracin 50,000 U/l)
- Parenteral broad spectrum antibiotics (clind/gent or amp/sulbactam)
- Tocolytics
- McDonald cerclage with monofilament #2 suture
- 7 days inpatient management
- Amniocentesis before birth of first infant or during first 24 hrs post cerclage
### Table I. Exclusion criteria for interval delivery

<table>
<thead>
<tr>
<th>Exclusion Criteria</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancies with delivery of ≥1 fetus</td>
<td>59</td>
</tr>
<tr>
<td>&lt;30 weeks’ gestation</td>
<td></td>
</tr>
<tr>
<td>(range 19 wk 3 days to 29 wk 6 days)</td>
<td></td>
</tr>
<tr>
<td>Excluded from interval delivery</td>
<td>48</td>
</tr>
<tr>
<td>Monochorionicity</td>
<td>9</td>
</tr>
<tr>
<td>Severe preeclampsia</td>
<td>5</td>
</tr>
<tr>
<td>Abruptio placentae</td>
<td>8</td>
</tr>
<tr>
<td>Both fetuses required delivery</td>
<td>7</td>
</tr>
<tr>
<td>Breech presentation, viable twin A</td>
<td>6</td>
</tr>
<tr>
<td>Hysterotomy required</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Total candidates for interval delivery</td>
<td>16</td>
</tr>
<tr>
<td>Attempted</td>
<td>9</td>
</tr>
<tr>
<td>Not done</td>
<td>7</td>
</tr>
<tr>
<td>Relatively advanced gestational age</td>
<td>6</td>
</tr>
<tr>
<td>Rapid delivery, both twins</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table II. Summary of attempted interval deliveries

<table>
<thead>
<tr>
<th>Case</th>
<th>Type of gestation</th>
<th>Gestational age at first delivery</th>
<th>Gestational age at completed delivery</th>
<th>Latency interval (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Twin</td>
<td>19 wk 3 days</td>
<td>21 wk 1 day</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Twin</td>
<td>19 wk 3 days</td>
<td>26 wk 4 days</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>Twin</td>
<td>24 wk 0 days</td>
<td>31 wk 0 days</td>
<td>49</td>
</tr>
<tr>
<td>4</td>
<td>Twin</td>
<td>24 wk 1 day</td>
<td>32 wk 6 days</td>
<td>61</td>
</tr>
<tr>
<td>5</td>
<td>Triplet*</td>
<td>27 wk 4 days</td>
<td>30 wk 4 days</td>
<td>21</td>
</tr>
<tr>
<td>6</td>
<td>Twin</td>
<td>27 wk 6 days</td>
<td>28 wk 6 days</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>Triplet†</td>
<td>26 wk 5 days</td>
<td>27 wk 1 day</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Triplet†</td>
<td>21 wk 0 days</td>
<td>24 wk 5 days</td>
<td>26</td>
</tr>
<tr>
<td>9</td>
<td>Twin</td>
<td>23 wk 0 days</td>
<td>33 wk 6 days</td>
<td>76</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>23 wk 6 days</td>
<td>28 wk 5 days</td>
<td>34</td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>19 wk 3 days – 27 wk 6 days</td>
<td>21 wk 1 day – 33 wk 6 days</td>
<td>3-76</td>
</tr>
</tbody>
</table>
"Families should be counseled regarding the possibility that a previable fetus who would die at delivery may survive in utero to be a barely viable infant with possible severe morbidity by an attempted delayed-interval delivery."

**Table III.** Perinatal outcome among patients in whom delayed-interval delivery was attempted (9 pregnancies, total of 21 infants)

<table>
<thead>
<tr>
<th>Gestational age at presentation</th>
<th>Firstborn (No. of survivors/total No.)</th>
<th>Retained (No. of survivors/total No.)</th>
<th>All infants (No. of survivors/total No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;24 wk</td>
<td>0/4</td>
<td>3/5</td>
<td>3/9</td>
</tr>
<tr>
<td>24-28 wk</td>
<td>3/6</td>
<td>6/6</td>
<td>9/12</td>
</tr>
<tr>
<td>Perinatal mortality (%)</td>
<td>70</td>
<td>18*</td>
<td>43</td>
</tr>
</tbody>
</table>

*Retained versus firstborn, $p = 0.03$, Fisher’s exact test.
• Delayed-interval delivery: Extended series from a single maternal-fetal medicine practice Farkouh, Sabin, Heyborne, Lindsay, Porreco.

• Prior 9 cases plus an additional 15 for a total of 24 DID
• Same technique
There were no survivors among firstborn infants when the gestational age at presentation was \(\leq 24\) weeks.

Of 18 retained siblings, 8 survived in this group.

<table>
<thead>
<tr>
<th>Gestational age at presentation</th>
<th>Firstborn (No. of survivors per total No. of infants)</th>
<th>Retained (No. of survivors per total No. of infants)</th>
<th>All survivors (No.) per total No. of infants</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\leq 24) wk</td>
<td>0/16</td>
<td>8/18</td>
<td>8/34</td>
</tr>
<tr>
<td>&gt;24 wk</td>
<td>4/9</td>
<td>9/9</td>
<td>13/18</td>
</tr>
<tr>
<td>Perinatal mortality rate*</td>
<td>84%</td>
<td>37%</td>
<td>60%</td>
</tr>
</tbody>
</table>

*Retained versus firstborn infants, \(P = .0007\), Fisher exact test.

In pregnancies that were at >24 weeks’ gestation at the time of presentation, 4 of 9 firstborn infants and all 9 of the retained siblings survived.
Patients with cerclage(s) placed before delayed-interval delivery and removed at the time of delivery of the first-born, latency intervals were <26 days (range, 3-25 days), with a mean of 11 days and a perinatal mortality of 77%.

In comparison with the group without previous cerclage, the mean latency intervals were significantly shorter (11 days vs 40 days).

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Type</th>
<th>Gestational age at cerclage (wk)</th>
<th>Gestational age at birth of firstborn (wk)</th>
<th>Gestational age at completed delivery (wk)</th>
<th>Latency (d)</th>
<th>Surviving infants (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3→2</td>
<td>26.6</td>
<td>26.7</td>
<td>27.1</td>
<td>3</td>
<td>2/3</td>
</tr>
<tr>
<td>10</td>
<td>2→1</td>
<td>18.0*</td>
<td>23.3</td>
<td>23.7</td>
<td>3</td>
<td>0/2</td>
</tr>
<tr>
<td>12</td>
<td>2→1</td>
<td>21.0</td>
<td>22.0</td>
<td>23.0</td>
<td>7</td>
<td>0/2</td>
</tr>
<tr>
<td>13</td>
<td>2→1</td>
<td>16.6</td>
<td>25.1</td>
<td>26.7</td>
<td>11</td>
<td>1/2</td>
</tr>
<tr>
<td>16</td>
<td>2→1</td>
<td>17.0†</td>
<td>21.0</td>
<td>24.6</td>
<td>25</td>
<td>0/2</td>
</tr>
<tr>
<td>20</td>
<td>2→1</td>
<td>13.4</td>
<td>19.1</td>
<td>21.4</td>
<td>16</td>
<td>0/2</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>18.7</td>
<td>22.9</td>
<td>23.4</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>13.4-26.6</td>
<td>19.1-26.7</td>
<td>21.4-27.1</td>
<td>3-25</td>
<td></td>
</tr>
</tbody>
</table>

*Cerclage replaced at 22.7 weeks.
†Cerclage replaced at 20.0 weeks.
Maternal morbidity

- 8 mothers had postpartum infections
- 7 had endometritis without abscess
- 1 had septic pelvic thrombophlebitis
- No transfusions
- No hysterectomies
- One fistula (unrelated)
Conclusions

“Ideal candidates for delayed-interval delivery are those in whom delivery of the first fetus occurs at an early gestational age (<24 weeks) and in whom no previous cerclage has been placed in the current pregnancy”
After a series of case reports and retrospective studies suggesting potential benefit for the second twin in selected cases...

Second-Trimester Asynchronous Multifetal Delivery Results in Poor Perinatal Outcome
Jeffrey C. Livingston, MD, Lisa W. Livingston, RN, BSN, Risa Ramsey, RN, PhD, and Baha M. Sibai, MD Obstet Gynecol 2004;103:77–81
A review of maternal and fetal medical records was performed at 2 tertiary care centers over 12 years.

Asynchronous delivery was defined as an active attempt (tocolysis and/or emergent cerclage placement) to increase latency between delivery of the first fetus and subsequent fetuses.

Fourteen cases of asynchronous delivery were identified out of 96,922 deliveries including 1,352 pregnancies complicated by multifetal gestation.

The occurrence rate of asynchronous delivery was 0.14 per 1,000 births.

The mean gestational age for delivery of the first fetus was 21.7 +/- 2.0 weeks.

19 retained fetuses, 2 died in utero, 10 died between birth and day 57 of life, and 7 survived (37%; 95% confidence interval 16%, 62%) until hospital discharge.

One of 19 fetuses was discharged without major sequelae (5%; 95% confidence interval 0%, 25%)

Maternal morbidity included 2 placental abruptions and 8 cases of infectious morbidity including 1 case of septic shock.

Most fetal survivors have significant damage from preterm birth.
2005 – Further caution


- A population-based retrospective cohort study using the U.S. “matched multiple birth” file (1995 to 1998), restricted to twin sets in which the first twin was delivered vaginally at 22 to 28 weeks (n = 4257).

- Outcomes examined included perinatal and infant mortality and small-for-gestational-age births

- Outcomes of second twins in pregnancies that underwent delayed interval delivery of 1, 2, 3, and ≥ 4 weeks were compared with those in which both twins were delivered contemporaneously.
The benefit of delaying delivery on perinatal mortality of the second twin was evident only when the first twin was delivered at 22 to 23 weeks and not at later gestational ages.
For pregnancies in which the first twin was delivered at 22 to 23 weeks, as the delivery interval increased, there was a progressively significant decline in perinatal mortality of the second twin for up to 3 weeks’ delivery interval.

No statistically significant benefit existed for delivery intervals of 4 weeks or greater.
With increasing delay between delivery of the twins, there was a progressive increase in mean birth weight of the second twin over the first.

However, the rates of SGA births in the second twin increased with increasing delivery interval.

This reached statistical significance for ≥4 weeks’ interval (for delivery at 22 to 23 weeks) and ≥2 weeks for delivery of the first twin at 24 to 28 weeks.
Delayed interval delivery and infant survival: A population-based study

Using the restricted-use US 1995-1998 Matched Multiple Birth File, linking live birth, fetal death, and infant death certificates for those who were reported to have been the product of a multiple pregnancy in the United States from 1995 through 1998.

208,057 pairs of twin pregnancies and 4,736 unlinked twin records

The study defined delayed interval delivery as the difference in dates of birth for 2 or more calendar days for a set of twins.

A comparison group of the nondelayed pregnancies was individually matched with the delayed deliveries on mother’s race (black or nonblack), vaginal birth, gestational age (in completed weeks), and birth weight within 15% of the first-born twin.
208,057 pairs of twins and 4,736 unlinked twin records from the U.S. 1995-1998 Matched Multiple Birth File

Delayed delivery (N = 200 pairs)
- 1st twin:
  - liveborn
  - vaginal birth
  - at 17 – 29 weeks

2nd twin:
Born 2 or more calendar days apart.

Individual matching (≈ 2:1) based on mother’s race, gestational age, and birthweight of 1st twin

To compare infant survival in 2nd twins

Non-delayed delivery (N = 374 pairs)
- 1st twin:
  - liveborn
  - vaginal birth
  - at 17 – 29 weeks
  - 1st twin opposite sex of 2nd twin

2nd twin:
Liveborn on the same day (N=348) or one calendar day apart (N=26).
More than half of the nondelayed second-born twins died within 24 hours. By 1 week, 70% died. In contrast, if the second delivery was delayed for 2 or more days, the feto-infant survival rate was remarkably better than the nondelayed group. Of the delayed second twin fetuses, 56% survived to 1 year of age (95% CI: 50%-64%) compared with 24% of the nondelayed second twins (95% CI: 20%-29%) (P < .001).

Figure 2  The feto-infant survival curves adjusting for maternal age, education, marital status, prenatal care, fetal sex of the second twin, and 95% confidence limits in delayed and nondelayed second born twins. The delayed group includes fetal death, which was counted as an event as an infant death. The nondelayed group had no fetal death.
Results

- Less than half of the delays were >7 days
- Median 6, range 2-107 days
- 1 week of delay = 131gms extra birth weight
- For very early gestation (17-23 weeks), 32% of the delayed second twin fetuses survived to 1 year of age (95% CI: 25%-42%), whereas only 7% of the nondelayed second twins survived to 1 year of age (95% CI: 5%-10%)
- For 24 to 29 weeks’ gestation, 89% of the delayed second twin fetuses survived to 1 year of age (95% CI: 83%-96%), whereas 66% of the nondelayed second twins survived to 1 year of age (95% CI: 58%-76%)

• A standard protocol was designed before candidates for delayed interval were managed by the 2 authors from 1991 to 2007. Perinatal and maternal outcomes were evaluated up to 1 year

• From 1991 to 2007, twin and triplet pregnancies born vaginally between 16 and 31 weeks and the delivery of the remaining multiples could be postponed were considered for DID.

• Aims were to reach viability and improve outcome by administering corticosteroids
Protocol: Identification of appropriate candidates

- Delivery of the first multiple because of progressive dilatation, preterm rupture of membranes, or vaginal engagement of the first fetus.
- **Contraindications:** fetal distress, congenital abnormalities, PROM of the remaining fetus(es), chorioamnionitis, and severe vaginal blood loss, suggesting impending placental abruption and maternal diseases.
- All patients received tocolytic therapy: intravenous ritodrine or intravenous atosiban followed by oral administration of nifedipine (2000-2007). In patients with refractory contractions, indomethacin suppositories were used.
- All patients were tested for vaginal and urinary bacterial colonization and then started on prophylactic antibiotic therapy with broad-spectrum antibiotics, such as Augmentin (amoxicillin and clavulanate potassium)
- Betamethasone was administered intramuscularly (12 mg for 2 doses) beyond 24 weeks of gestation.
Protocol: Delivery of the 1st baby

- During the delivery of the first baby, administration of tocolysis and antibiotic therapy was continued and episiotomy avoided.
- After delivery of the first baby, cultures were taken from the umbilical cord of the first multiple and the cervix.
- Before high ligation of the umbilical cord, vaginal and cervical washing was performed with chlorhexidine.
- Cervical cerclage was never attempted.
- In rhesus-negative women, 1000 IU of anti-D globulin was injected intramuscularly.
Protocol: Interval

- Monitoring focused on the early detection of chorioamnionitis, recurrent preterm contractions, signs of threatening abruption, and coagulation disorders.
- Body temperature was measured at least 4 times daily. Cervical cultures were taken weekly, and antibiotic therapy was adapted based on culture results.
- Laboratory tests to rule out infection and coagulation disorders were performed at regular intervals.
- Patients were discharged only when vaginal sonography could prove that the cervix had restored, with retraction of the first separated umbilical cord.
Protocol: Delivery of the second twin

- Indicated because of signs of fetal distress, amnion infection, or maternal complications
- Delayed interval delivery between the first and remaining twins and triplets was expressed in completed days
Table 1
Study population of the prospective cohort (n = 50), with asynchronous delivery included in the 4-step protocol

<table>
<thead>
<tr>
<th>Variable</th>
<th>Twin pregnancies (n = 38)</th>
<th>Triplet pregnancies (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age (mean/range)</td>
<td>30.7 (23-39)</td>
<td>30.6 (27-35)</td>
</tr>
<tr>
<td>Conception (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous</td>
<td>21 (55%)</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>Ovulation induction</td>
<td>4 (11%)</td>
<td>4 (33%)</td>
</tr>
<tr>
<td>In vitro fertilization, including intracytoplasmic sperm injection</td>
<td>13 (34%)</td>
<td>7 (58%)</td>
</tr>
<tr>
<td>Chorionicity (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCDA (twins) TC (triplets)</td>
<td>34 (89%)</td>
<td>11 (92%)</td>
</tr>
<tr>
<td>MCDA (twins) DCTA (triplets)</td>
<td>4 (11%)</td>
<td>9 (8%)</td>
</tr>
<tr>
<td>Gestational age at birth of first multiple (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 25 wk</td>
<td>18 (47%)</td>
<td>7 (58%)</td>
</tr>
<tr>
<td>25-31 wk</td>
<td>20 (53%)</td>
<td>5 (42%)</td>
</tr>
</tbody>
</table>

DCDA, dichorionic/diamniotic; TC, trichorionic.

**TABLE 2**

Outcome in terms of interval of delay, birthweight, mode of delivery, and outcome in the cohort with asynchronous delivery included in the 4-step protocol

<table>
<thead>
<tr>
<th>Variable</th>
<th>Twin pregnancies (n = 38)</th>
<th>Triplet pregnancies (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval (days) between delivery of first and second twin/triplet</td>
<td>19 (1-106)</td>
<td>18 (1-118)</td>
</tr>
<tr>
<td>Respectively of second/third triplet (mean/range)</td>
<td></td>
<td>1 (0-2)</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First and remaining vaginally</td>
<td>29 (76%)</td>
<td>9 (75%)</td>
</tr>
<tr>
<td>First vaginally/second (plus third), CS</td>
<td>9 (24%)</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>Birthweight (g) (mean/range)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin 1/triplet 1</td>
<td>690 (140-1660)</td>
<td>413 (180-830)</td>
</tr>
<tr>
<td>Twin 2/triplet 2</td>
<td>1060 (250-3000)</td>
<td>630 (150-1000)</td>
</tr>
<tr>
<td>Triplet 3</td>
<td></td>
<td>734 (280-1200)</td>
</tr>
<tr>
<td>Mortality until discharge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin 1/triplet 1</td>
<td>25/38 (66%)</td>
<td>9/12 (75%)</td>
</tr>
<tr>
<td>Twin 2/triplets 2 and 3</td>
<td>10/38 (26%)</td>
<td>18/24 (75%)</td>
</tr>
<tr>
<td>CS, cesarean section.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FIGURE 3
Representation of intervals between the delivery of the first and second twin

A
n=15 pregnancies, No 1st survivor
9 2nd survivors (60%)
mean delay: 28(1-103) days
1st Delivery
20-24+6 weeks
n=3 pregnancies, no survivor
mean delay: 14 (5-28) days
1st Delivery
16-19+6 weeks

B
n=5 pregnancies
5 1st and 2nd survivors
mean delay: 8 (1-9) days
1st Delivery
29-31 weeks
n=15 pregnancies,
8 1st survivors, 14 2nd survivors (50% vs. 94%)
mean delay: 16 (1-53) days
1st Delivery
25-28+6 weeks
No survivors if 1st baby delivered before 20 weeks.
If the 1st delivery was between 20 and 25 wks there was no 1st survivor and 60% 2nd survivors (inl 1st twin SB)
If the 1st delivery was between 25 and 29 wks there were 50% 1st survivors and 94% 2nd survivors.
If the 1st delivery was between 29 and 31 wks there were 100% 1st survivors and 100% 2nd survivors.
### TABLE 3
Maternal morbidity within the study population (n = 50)

<table>
<thead>
<tr>
<th>Variable (n/%)</th>
<th>Twin pregnancies (n = 38)</th>
<th>Triplet pregnancies (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morbidity I (high chance associated with management)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical signs of chorioamnionitis</td>
<td>9 (24%)</td>
<td>2 (17%)</td>
</tr>
<tr>
<td>Abruption</td>
<td>2 (5%)</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Postpartum hemorrhage &gt; 1 l</td>
<td>4 (11%)</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Manual removal of placenta</td>
<td>4 (11%)</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Urosepsis</td>
<td>—</td>
<td>1 (8%)</td>
</tr>
<tr>
<td>Morbidity II (low chance associated with management)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transient atrium fibrillation</td>
<td>1 (3%)</td>
<td>—</td>
</tr>
<tr>
<td>Appendectomy 3 d postpartum</td>
<td>1 (3%)</td>
<td>—</td>
</tr>
</tbody>
</table>

• 4 cases of monochorionic twins – mean DID 9 days (range 3-16 days)

• In conclusion, delayed-interval delivery appears to be associated with improved perinatal outcomes for those second twins whose delivery is delayed when the first co-twin is delivered between 20 and 29 weeks.

• This study did not document significant improvement in triplet or twin pregnancies with a delivery of the first twin before 20 weeks. However, the numbers are too small to discourage this management.
Who is the best candidate?

- Gestational age between 20 and 29 weeks
- Chorionicity uncertain – both DiMo and DiDi have succeeded
- No active bleeding
- No infection
- No prior cerclage
- Twins or triplets
So what is the best technique?

At delivery of first twin
- Cord ligation high with absorbable suture
- Leave placenta alone
- Take cultures
- Vaginal cleansing with chlohexidine/iodine/antibiotic solution
- Use a tocolytic
- Use a broad spectrum antibiotics
- Cerclage is of uncertain benefit. Monofilament possibly better.
- Amniocentesis before or soon after delivery of 1st twin
Technique

- Post 1st delivery monitoring
  - Culture monitoring
  - Serial TVUS and growth
  - Bedrest for a week
  - CMP – in one study – uncertain utility
  - FDP/fibrinogen – never shown to be useful
  - Serial WBC
Final Conclusions

- Evidence for improved outcome for second twin if 1st delivery 20-29 weeks
- Outcome proportional to length of delay
- Delay >4 weeks associated with SGA and no improvement in outcome
- High risk of maternal infectious morbidity
- Little benefit if 1st delivery after 24 weeks
- Evidence for cerclage unclear