Outcome of Twins Delivery; Predictors for Successful Vaginal Delivery: A Single Center Experience

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The aim of this study was to compare maternal and neonatal outcome of twin births according to mode of delivery and to isolate the factors predicting a successful vaginal delivery and those predicting a failed trial of labor (TOL) leading to an emergent cesarean section. We reviewed all twin deliveries during the years 1995 to 2004. Parameters studied include maternal age, parity, gestational age, maternal antepartum complications and postpartum complications, fetal presentations, birthweight, mode of delivery of each twin, Apgar scores and cord pH. During the study period there were 40,710 deliveries of which 804 (1.9%) were twin deliveries. Of the 804 twins, 398 (49.5%) had planned cesarean sections (PCS) and 406 (50.5%) entered a TOL. Maternal age and parity were similar among the groups. Neonatal outcomes and postpartum complications did not differ between the groups. Of 406 women who had a TOL, 84.9% eventually delivered both twins vaginally. A significantly higher percentage of antepartum complications were noted among those who failed the TOL compared to those with successful TOL (8.2% vs. 1.7%, $p = .01$). The number of neonates with pH of less than 7.0 did not differ between the groups although more neonates (2.5% vs. 0.4%, $p = .05$) among the failed TOL had an Apgar score of less than 7.0 at 5 minutes compared to successful TOL. Vaginal delivery of both twins after TOL occurred in 91% of vertex/vertex compared with 71.8% of vertex/nonvertex presenting twins ($p < .01$). Neonatal outcomes did not differ between both groups. Our results indicate that both vaginal and PCS are comparable options for vertex presenting first twin regardless of second twin presentation.

Twin gestations comprise approximately 1% to 2% of all pregnancies, but account for a disproportionately large share of adverse outcomes, thus presenting a major challenge for obstetricians (Boggees & Chisholm, 1997; DeVeciana et al., 1995). The number of twin deliveries has risen in the past two decades, mostly due to the use of fertility-stimulating therapy, and has become a major public health concern. Adverse outcomes associated with twin gestations are mainly a consequence of preterm delivery and low birthweight (Boggees & Chisholm, 1997; El-Jallad et al., 1998; Fakeye, 1986; Kouam et al., 1988; Liapis et al., 1997), whereas malpresentation and the hazards of delivery are next in order of concern (Boggees & Chisholm, 1997; Fakeye, 1986).

The mode of delivery in twin gestations has been a major point of debate among obstetricians. Reviewing the literature, we found only one small, randomized controlled trial that examined the issue of the appropriate mode of delivery (Rabinovici et al., 1987). Other nonrandomized studies were small and did not provide a definitive answer to the question of a planned cesarean section (PCS) versus vaginal delivery.

When the presenting twin is in breech presentation, the American College of Obstetricians and Gynecologists (ACOG) educational bulletin recommends cesarean section because the safety of vaginal birth has not been documented (Anonymous, 1999). The best approach to the delivery of vertex–vertex or vertex–nonvertex twins is controversial. A 1999 ACOG educational bulletin admits that the data are conflicting. Regarding the nonvertex second twin, it states that vaginal birth is reasonable if infants weigh more than 1500 g and criteria for vaginal breech delivery are met, but that the evidence is insufficient to advocate a specific route of delivery for infants weighing less than 1500 g (Anonymous, 1999). Moreover, although it might be reasonable to generalize the findings of the Term Breech Trial (Hannah et al., 2000) to term twins if Twin A is breech, it would be inappropriate to generalize these findings to Twin B if Twin B is breech.

In this study we aimed to compare neonatal and maternal outcomes according to the planned mode of delivery. We also sought to estimate the consequences of a trial of labor (TOL) in cases where the first twin presented in the vertex position, regardless of the

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presentation of the second twin. In addition, we attempted to isolate the factors predicting a successful vaginal delivery and those predicting a failed TOL leading to an emergent cesarean section. We believe that defining those cases in which a vaginal delivery failure is more likely will provide caretakers with the tools necessary to counsel patients with twin gestations.

Patients and Methods

We conducted a review of all twin deliveries during the years 1995 to 2004 at Ha'Emek Medical Center Labor Unit, a university affiliated hospital. Data of all twin sets during these years was collected from labor room records and patient files. Parameters studies included (a) Maternal parameters: maternal age, parity, gestational age at birth, antepartum maternal complications (diabetes in pregnancy, thrombophilia, hypertensive disorders, amnionitis, placental abruption and maternal cardiac disease) and postpartum complications (postpartum complications that were evaluated include genitourinary tract infections, septicemia, pelvic cellulites, pelvic deep vein thrombosis and postpartum hemorrhage [PPH] requiring blood transfusion) and (b) Neonatal and fetal parameters: gestational age at birth, fetal presentations, weight, mode of delivery of each twin, Apgar scores and umbilical-artery blood pH. Cases in which cesarean section was performed after a TOL were further investigated and the indications for cesarean section were noted. Major anomalies, conjoined twins, and intrauterine fetal deaths were excluded.

Mode of delivery of all twins was categorized into two groups. The PCS group included all patients intending to deliver by cesarean section, including those patients who were operated on shortly after labor had begun prior to the scheduled date of surgery. The TOL group included those deliveries in which a TOL was decided upon in the early stages of labor, regardless of the eventual mode of delivery.

Our department's protocol regarding twin delivery is as follows. At admission gestational age, obstetric and general history is assessed. Lie and presentation of each fetus is determined by ultrasound. Intravenous access is secured and blood sent for group and antibody screen. Options as to mode of delivery are presented and discussed with the couple unless there is a clear indication for abdominal delivery. Indications for cesarean section in twin gestations include indications for cesarean section as for singleton pregnancies, nonvertex presentation of the first twin, monoamniotic or conjoined twins other than at gestations remote from term, and a patient's request for cesarean section following a detailed explanation of hazards and complications. Women with a previous cesarean section (transverse lower segment incision) were allowed a TOL. When vaginal delivery is agreed upon, continuous electronic fetal heart rate monitoring of both twins is initiated and continued until delivery. The progress of labor is clearly documented. Oxytocin augmentation is used when indicated before the delivery of the first twin and/or between delivery of Twin A and B. An abdominal ultrasound is performed after delivery of the first twin in order to confirm presentation. A physician competent to manage a twin birth and skilled in vaginal breech delivery is attendant in the labor unit. Cesarean section is available immediately when indicated. Immediate availability means the presence and timely availability of anesthetic, obstetrical, neonatal, and nursing staff trained in emergency caesarean delivery. Umbilical-artery blood pH is drawn at the time of delivery from both neonates.

The protocol was approved by the hospital Institutional Review Board.

Means and standard deviations were calculated using Microsoft Excel XP Professional (Microsoft Corporation, USA). Student's *t* test was used for comparisons of continuous variables while the chi-square and Fisher-exact tests were used for comparison of categorical variables between the two groups. A logistic regression model was performed to estimates the odds ratio for abdominal delivery after a TOL when multiple risk factors predicted failed trial of labor were present. A *p* value of less than .05 was considered significant.

Results

During the study period, there were 40,710 deliveries at Ha'Emek Medical Center Labor Unit, of which 804 (1.9%) twin deliveries fulfilled the study criteria. Forty-two per cent presented as vertex–vertex, 29.8% as vertex–nonvertex and 28.2% as nonvertex first twin. Of 804 patients, 398 (49.5%) had a PCS, and 406 (50.5%) had a trial of labor (TOL). Maternal demographic parameters and outcome of both groups are listed in Table 1. Of all postpartum complications,

Table 1

Maternal Demographic Parameters and Outcome

	Trial of labor (*N* = 406)	Planned cesarean (*N* = 398)	*p*
Maternal age (years), mean (*SD*)	29.5 (4.8)	30.3 (4.8)	.3
Parity, mean (*SD*)	2.6 (1.7)	2.5 (1.8)	.4
Gestational age at delivery (weeks), mean (*SD*)	36.3 (3.0)	35.4 (3.7)	< .01
Antepartum complications, number of women* (%)	11 (2.7)	65 (16.3)	< .01 OR = 7.0 CI 3.6–13.5
Postpartum complications, number of women** (%)	10 (2.5)	11 (2.8)	.8

Note: *Antepartum maternal complications include diabetes in pregnancy, thrombophilia, hypertensive disorders, amnionitis, placental abruption and maternal cardiac disease.

**Postpartum complications include genitourinary tract infections, blood transfusion, septicemia, pelvic cellulites and pelvic vein thrombosis.

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Table 2

Neonatal Outcome Among the Trial of Labor and Planned Cesarean Groups

	Trial of labor (*N* = 406)	Planned cesarean (*N* = 398)	*p*
Birthweight of 1st twin (grams), mean (*SD*)	2411 (537.4)	2245 (631.6)	< .01
Birthweight of 2nd twin (grams), mean (*SD*)	2347 (538.5)	2214 (640.0)	< .01
Cord blood pH at birth, 1st twin, mean (*SD*)	7.31 (0.1)	7.33 (0.1)	< .01
Cord blood pH at birth, 2nd twin, mean (*SD*)	7.27 (0.1)	7.32 (0.1)	< .01
Cord blood pH at birth ≤ 7.0, number of neonates (%)	6 (0.7)	2 (0.3)	.3
Apgar score < 7.0 at 5 minutes, number of neonates (%)	6 (0.7)	4 (0.5)	.8

two cases of severe PPH in the PCS group required hypogastric legation. Neonatal outcomes of twins in each category are listed in Table 2. Mean cord blood pH at birth was significantly lower in the TOL group for both twins. The pH for both groups was, however, within normal limits and the number of acidemic neonates (pH ≤ 7.0) did not differ significantly between the two groups.

Within the TOL subgroup, we compared maternal and neonatal parameters among deliveries in which both twins were delivered vaginally and those in which one or both were delivered by cesarean section (Table 3). As shown in Table 3, there was a significantly greater percentage of antepartum maternal complications among those with a failed TOL. The number of neonates with an Apgar score less than 7.0 at 5 minutes was significantly higher in the failed TOL group, nevertheless, none had a 5-minute Apgar score of less than 4. The number of neonates with pH less than or equal to 7.0 did not differ significantly between the two groups.

Almost 85% of twins given a trial of labor were eventually successfully delivered by vaginal route. Of this group, 4.6% of the neonates were delivered by vaccum extraction. Of 406 women in the TOL group, 264 had a vertex presenting (VP) second twin and 142 had a nonvertex presenting (NVP) second twin. Assisted breech delivery or total breech extraction were used to deliver the breech second twin. When external version (without tocolytics) failed to convert transverse lie second twin to vertical presentation, internal podalic version was attempted. Of the 142 patients with a NVP second twin, 102 (71.8%) delivered both neonates vaginally. Of the 264 patients with a VP second twin, 243 (91%) delivered both neonates vaginally ($p < .01$, odds ratio [OR] = 4.5, 95% confidence intervals [CI] 2.5–8.1).

Table 3

Maternal and Neonatal Parameters of Twins Delivered Both Vaginally and Those Delivered Either or Both by Cesarean Within the Trial of Labor Subgroup

	Both twins delivered vaginally (*N* = 345)	Either or both delivered by cesarean (*N* = 61)	*p*
Parity, mean (*SD*)	2.6 (1.7)	2.3 (1.5)	.2
Gestational age (weeks), mean (*SD*)	36.3 (3.0)	36.8 (2.7)	.2
Antepartum complications, number of women* (%)	6 (1.7)	5 (8.2)	.01 OR = 5.0 CI 1.5–17.1
Birthweight of 1st twin (grams), mean (*SD*)	2402 (534.8)	2508 (550.6)	.2
Birthweight of 2nd twin (grams), mean (*SD*)	2359 (549.8)	2376 (500.2)	.8
Cord blood pH at birth, 1st twin, mean (*SD*)	7.30 (0.1)	7.29 (0.1)	.3
Cord blood pH at birth, 2nd twin, mean (*SD*)	7.28 (0.1)	7.27 (0.1)	.4
Cord blood pH at birth ≤ 7.0, number of neonates (%)	4 (0.6)	2 (1.6)	.2
Apgar score < 7.0 at 5 minutes, number of neonates (%)	3 (0.4)	3 (2.5)	.05 OR = 5.8 CI 1.2–29.0

Note: *Maternal complications include diabetes in pregnancy, thrombophilia, hypertensive disorders, amnionitis, placental abruption and maternal cardiac disease.

Table 4

Neonatal Outcomes After Vaginal Delivery of Vertex Presenting and Nonvertex Presenting Second Twin

	VP second twin (*N* = 243)	NVP second twin (*N* = 102)	*p*
Birthweight of 2nd twin (grams), mean (*SD*)	2377 (546.1)	2314 (559.7)	.4
Cord blood pH at birth, 2nd twin, mean (*SD*)	7.29 (0.1)	7.26 (0.1)	.1
Cord blood pH at birth ≤ 7.0, number of neonates (%)	1 (0.4)	2 (2.0)	.2
Apgar score < 7.0 at 5 minutes, number of neonates (%)	1 (0.4)	1 (1.0)	.5

Note: VP denotes vertex presentation and NVP denotes nonvertex presentation

We compared the neonatal outcome after vaginal delivery of the VP and the NVP second twin. Mean maternal age, gestational age, and parity were not different between both groups. No statistically significant difference in neonatal outcomes was shown between second twins in VP and NVP (see Table 4). No cases of birth trauma or neonatal death were recorded.

When TOL failed, indications for performing cesarean section were noted and the data are presented in Table 5.

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Table 5

Indications for Cesarean Section Within the Trial of Labor Group

	Cesarean for both twins (*N* = 34)	Cesarean for 2nd twin only (*N* = 27)	Total *N* = 61
Nonprogressive labor	23	5	28 (45.9%)
Nonreassuring monitor	9	11	20 (32.8%)
Failed version from transverse lie	0	11	11 (18%)
Cord prolapse	0	2	2 (3.3%)

Table 6

Neonatal Outcomes of Co-Twins Delivered by Combined Vaginal and Cesarean Delivery

	1st twin delivered vaginally (*N* = 27)	2nd twin delivered by cesarean (*N* = 27)	*p*
Birthweight (grams), mean (*SD*)	2448 (558.6)	2253 (452.2)	.2
Cord blood pH at birth, mean (*SD*)	7.32 (0.1)	7.22 (0.1)	.01
Cord blood pH at birth ≤ 7.0, number of neonates (%)	0	0	*ns*
Apgar score < 7.0 at 5 minutes, number of neonates (%)	0	3 (11.1)	.2

Of the 238 patients without any antepartum complication and a second twin in the vertex position, 92.6% delivered both twins vaginally. Compared to this subgroup, only 25% women with both an antepartum complication and a nonvertex second twin, delivered both twins vaginally (p = .002, OR 37.6, 95% CI 3.7–378.9).

Within the TOL group, 16 cases (4.6%) of discordant twins (birthweight difference > 25%) were present in the vaginal delivery group compared to five (8.2%) in the emergency cesarean section group respectively (p = .2). There was no significant difference between primiparous and multiparous patients for failure to deliver both twins vaginally.

Of 406 pairs of twins given a TOL, there were 27 (6.7%) where Twin A was delivered vaginally and Twin B by emergency cesarean section. The outcomes of co-twins delivered by combined vaginal route and emergency cesarean section are shown in Table 6.

Finally, of 406 twins who had a TOL, 384 were delivered after 32 weeks gestation. We compared twins delivered vaginally and those delivered by cesarean section in this subgroup. Demographics and outcomes in this subgroup were similar to the whole group.

Discussion

The question of best delivery approach for twin births, particularly when the first twin presents in the vertex position, regardless of the presentation of the second twin, still remains unanswered in the current literature. The goal of our study was to compare neonatal and maternal outcomes according to the planned mode of delivery, that is, cesarean section versus vaginal delivery. During the study period, approximately half of all twin sets delivered at our delivery unit were allowed a TOL. In this group, mean gestational age and birthweights of twins were significantly higher than in the group undergoing a planned cesarean section, whereas rates of maternal complications during pregnancy were significantly lower. This could be attributed to the fact that women in the PCS group had significantly more antepartum complications, most likely influencing the decision for earlier delivery. Another possible explanation is that the decision to operate patients destined to undergo a cesarean section who present with preterm labor, will most likely be taken at the beginning of labor; whereas in patients desiring a TOL, efforts to delay delivery will be carried out until active labor is well in progress. Thus, woman in the PCS group presenting with signs of preterm labor may be delivered at an earlier gestational age than women in the TOL group.

Neonatal outcome was assessed using 5-minute Apgar score and cord blood pH at birth. No significant difference in the 5-minute Apgar score was found between the two groups. Many of the studies we reviewed chose the Apgar score as an indicator of twin outcome after TOL or cesarean section. In most of these studies, no significant difference was found in the Apgar score (Blickstein et al., 2000; Caukwell & Murphy, 2002; Grisaru et al., 2000; Zhang et al., 1996). In our study, cord pH at birth was also noted and provided additional information concerning neonatal outcome. We found a significantly lower pH at birth for both twins in the TOL group, although it is important to note that the mean pH for both twins was within normal limits. Reviewing the literature, we found little regard for cord pH at birth. Winn et al. (2001) reported no difference in cord pH at birth between the two groups, except a lower venous pH in infants with birthweights of less than 1500 g. It is questionable whether our finding has clinical significance since the pH for both twins is well within normal limits.

Overall maternal morbidity was not influenced by the mode of delivery (see Table 1). Although serious complications (two cases of hypogastric legation and one case of pelvic vein thrombosis) occurred solely among women delivered abdominally, the numbers were too small to be used in statistical tests.

Another goal of this study was to evaluate the outcome and success of vaginal delivery for twins, when the first twin presents in the vertex position, regardless of the presentation of the second twin, as well as to isolate predicting factors for failed and successful TOL. Overall, 85% of patients carrying twins who entered a TOL eventually succeeded in delivering both twins vaginally, regardless of the presentation of

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the second twin. Of twins in the vertex–vertex presentation, 91% were delivered vaginally. A failed TOL was most commonly due to a nonreassuring fetal heart rate, nonprogressive labor or persistent transverse lie after an attempt at version. Compared to 91% of vertex–vertex presenting twins, only 71.8% of twins presenting in the vertex–nonvertex presentation were delivered vaginally. According to our data, significant risk factors for failed TOL included maternal complications during pregnancy and NVP second twin. When both antepartum complications and a nonvertex second twin present, 75% delivered abdominally compared to only 7.4% of women without antepartum complications who had a vertex second twin.

Neonatal outcome, however, was similar for both groups. Maternal age, parity, gestational age, twin birthweights and discordant birthweight were not found to be predictive factors for failed TOL.

The consequences of a failed TOL on twin neonatal outcome was determined by comparing cord blood pH and Apgar scores of twins delivered vaginally to those with failed TOL and emergent cesarean section for one or both twins. We found significantly more twins with a 5-minute Apgar score of less than 7.0 in the failed TOL group. However none had a 5-minute Apgar score of less than 4.0 and there was no difference, in the incidence of acidemic neonates (pH less than 7.0). No clinical difference in neonatal outcome was found between the first and second twin when the first twin was delivered vaginally and the second twin by emergent cesarean section. Rabinovici et al. (1987) reported also that the neonatal outcome of the second twin was not significantly influenced by the route of delivery. However, the number of these cases in our study was too small to provide power to analyze differences in this subgroup.

Our policy regarding the mode of delivery of breech-presenting second twins is assisted breech delivery or total breech extraction. No cases of birth trauma or neonatal death were recorded. These maneuvers seemed safe when performed by a physician competent to manage a twin birth and skilled in vaginal breech delivery. There are no randomized controlled data indicating which approach is preferable for vaginal delivery of the second breech twin and clinicians tend to choose the approach they are most experienced in. However, retrospective data suggest that breech extraction may result in fewer intrapartum and neonatal complications compared with external cephalic version followed by vaginal cephalic delivery (Levinsky & Barrett, 1998).

Hogle et al. (2003) reviewed all articles published between 1980 and 2001 comparing planned cesarean section with planned vaginal birth for twins with respect to perinatal and maternal outcomes. These studies compared cesarean sections with vaginal births without differentiating planned cesarean sections from those performed after a failed TOL and some do not present the data according to the intended mode of delivery or report outcomes after the exclusion of the TOL group. Of a total of 67 articles reviewed, only four (comprising 1932 infants) were included. Twins delivered by planned cesarean section spent significantly more time in the hospital. There were no significant differences in perinatal or neonatal mortality, neonatal morbidity, or maternal morbidity. In this meta-analysis, data was not provided regarding vertex–vertex twins specifically.

According to our study (a single center experience with 1608 infants), both vaginal and planned cesarean deliveries appear to be comparable options for vertex presenting first twin. The availability of experienced medical stuff and operating facilities are a prerequisite before attempting a TOL. Planned cesarean delivery may be advisable when both noncephalic presentation of the second twin as well as maternal antepartum complications are present.

Limitations of this study include the fact that it is a retrospective review. Due to inadequate reporting, we were not able to isolate and evaluate the effect of labor induction or augmentation regarding the probability of success and risks in the TOL group. Moreover, and for the same reason, chorionicity and whether induction of ovulation was used, were also not evaluated. Until an appropriately designed randomized controlled trial is undertaken, information reported in this study regarding probability of success and risks involved should be discussed with the patients, allowing an informed decision regarding mode of delivery.

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