

## Perinatal Outcome of the Second Twin at a Tertiary Care Center in India

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### Abstract

**Purpose** This cross-sectional observational study was undertaken to assess perinatal outcome of the second twin

in respect to gestational age, presentation, mode of delivery, and birth weight.

**Methods** Seventy women with confirmed twin pregnancy were admitted and managed in a tertiary care teaching hospital in Kolkata, India from May 2008 to April 2009. All relevant data were recorded and analyzed statistically by simple proportions and  $\chi^2$  test.

**Results** Women with frequent antenatal visits had highly favorable perinatal outcome than those with fewer or no visits in this hospital ( $p < 0.001$ ). Higher perinatal mortality was observed among preterm than term ( $p < 0.01$ )

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cases, and among low birth weight than normal babies ( $p < 0.05$ ). Second twins in vertex–vertex presentation encountered higher perinatal mortality compared to those in vertex–nonvertex and nonvertex–other presentations ( $p < 0.05$ ). Perinatal outcome was unfavorable when both delivered vaginally than for both cesarean deliveries and cesarean after first vaginal delivery ( $p < 0.01$ ). Preterm labor was the most frequently observed maternal complication. Birth asphyxia and perinatal mortality were common among second than first twins.

**Conclusions** Gestational age, presentation, mode of delivery, and birth weight are the significant determinants of perinatal outcome of the second twin. Women with frequent antenatal care show favorable outcome. The second twin is at higher risk of perinatal morbidity and mortality than the first twin.

**Keywords** Birth weight · Gestational age · Perinatal mortality · Second twin · Twin pregnancy

## Introduction

Twin pregnancy is becoming a problem of increasing dimensions worldwide with the dramatic increase of its incidence mostly attributable to assisted reproductive technologies (ARTs) [1]. Its incidence varies worldwide. The twinning rates are low (6–9 per 1000 births) in the whole of Eastern, South-Eastern, and Southern Asia including India. Latin America has low twin birth rates as those in Asia. The twin-birth rates in Europe and North America are intermediate, 9–16 per 1000 births. High national twinning rates of above 18 per 1000 births are found throughout Central Africa [2].

The study of twin or multiple births is important because of the elevated health risks for both mothers and babies, and accompanying greater health care cost [3]. Perinatal mortality and morbidity in twin pregnancy is five–seven times higher compared to singleton pregnancy [4]. Prematurity, low birth weight (LBW), birth asphyxia, birth trauma, intrauterine fetal death, and congenital malformations are the important factors to explain the reasons of high perinatal mortality.

Observational studies showed that the second twins are particularly at higher risk of perinatal death than the first twins. The second twin is more likely to have lower Apgar scores, less favorable umbilical arterial or venous parameters, a higher incidence of respiratory distress syndrome, a higher need for intubation, and a higher perinatal mortality [5–7]. Their disadvantage was attributed to differences in gender, birth weight, chorionicity, presentation, mode of delivery, time interval between births, birth trauma, instrumental delivery, and asphyxia. Most of the above observations are from the studies done in Europe and North

America. In India, the data are scarce regarding the perinatal outcome of the second twins and the significant mediating factors for that outcome.

With the above background, the present study was undertaken with the following objectives:

- (1) To find out the magnitude of perinatal outcome of the second baby in twin pregnancy in respect to gestational age, presentation, mode of delivery, and birth weight.
- (2) To find out the association, if any, of perinatal outcome of the second twin with the above variables.

## Materials and Methods

### Type of Study

Hospital-based cross-sectional descriptive study.

### Place of Study

The study was conducted in the Department of Obstetrics and Gynecology, Nilratan Sircar Medical College and Hospital, a tertiary care hospital in Kolkata, India.

### Duration of Study

One year, from May 2008 to April 2009.

### Study Population

All women with confirmed diagnosis of twin pregnancy admitted and managed in the above-mentioned hospital.

### Inclusion Criteria

(1) Diagnosis of twin pregnancy confirmed by ultrasound examination; (2) gestational age of 28 weeks or more, or estimated fetal weight of 1000 g or more; (3) no known pre-existing medical complication like chronic hypertension, diabetes mellitus, renal disease, collagen vascular disease, or any other disorder that could complicate the present pregnancy; and (4) absence of congenital anomalies in either fetus.

### Study Tools

(1) Case record form; (2) present and past health records and investigation reports, if any; (3) all antenatal records regarding present pregnancy; (4) hospital records; (5) stethoscope and sphygmomanometer; and (6) ultrasound machine.

## Study Technique

(1) History taking, and (2) clinical examination and investigations.

## Methodology

Ethical clearance for doing this study was obtained from the Institutional Ethics Committee. Informed consent to participate in the study was obtained from all the eligible women. Out of 80 eligible women who were initially included for the study, 70 women fulfilled all the criteria for inclusion in this study and for statistical analysis.

The booked cases in this hospital who had been registered early in pregnancy were followed up in antenatal clinic at regular intervals with periodic ultrasound surveillance. Routine admission was done at 34 weeks. For all the study participants, babies were delivered in this hospital, and perinatal outcome were noted.

All the relevant information were recorded in the case record form, e.g., maternal age, gravidity, parity, number of antenatal visits, detailed history, clinical examination findings including obstetric examination, ultrasound reports, gestational age at birth, presentation of both the fetuses at labor and delivery, mode of delivery, birth weight, and lastly, perinatal outcome of the babies including perinatal morbidity (neonatal illness and complications), and mortality (stillbirth and early neonatal death).

## Analysis of Data

Data were collated and analyzed statistically by simple proportions and  $\chi^2$  test.

## Results

This study was conducted on 70 women with twin pregnancy. More than 60 % women (45 or 64.28 %) were admitted in the hospital through the antenatal clinic (elective). Twenty-five (35.72 %) women were admitted through the obstetrics and gynecology emergency unit.

Table 1 depicts the characteristics of the mother carrying twin pregnancy. Most women (46 or 65.71 %) were between 20 and 29 years of age group, and only 11 (15.72 %) women were in the age group of 30 years or older. Mean maternal ages in less than 20 and 20 years or older age group were 17.92 and 25.04 years, respectively. The lowest age reported was 16 years, and the highest age was 33 years. However, maternal age was not found to be associated with perinatal outcome of the second twin. Among 70 women, nearly 70 % (48 or 68.57 %) were

multigravida, out of which 30 (42.86 %) were primipara, and 18 (25.71 %) were multipara. Perinatal mortality of the second twin was significantly higher (45.83 %) among multigravida women than primigravida women (18.19 %;  $p < 0.05$ ). Nearly 60 % (58.57 %) women attended antenatal clinic at least three times or more, and the lowest perinatal mortality (14.63 %) was observed among them. Six out of nine unbooked cases in this hospital experienced perinatal death of the second twin. Perinatal outcome of the second twin was significantly associated with the number of antenatal visits by the mother ( $p < 0.001$ ).

Table 2 shows perinatal outcome of the second twin according to fetal/neonatal characteristics. The majority of women (31 or 44.28 %) delivered at 34–36 weeks, followed by 24 women (34.29 %) who delivered at 37–39 weeks. Twenty percent (14) women delivered at 28–33 weeks. Only one woman delivered at 40 weeks of gestation. Perinatal mortality of the second twin was three times higher in case of preterm birth (<37 weeks) than that of term birth ( $\geq 37$  weeks; 48.89 vs. 16 %), and this difference was statistically significant ( $p < 0.01$ ). Most common fetal presentation during labor and delivery was vertex–vertex (57.14 %). Perinatal mortality of the second twin was significantly higher (50 %) among twins with vertex–vertex presentation than that in other two presentations (22.22 % in vertex–nonvertex and 16.67 % in nonvertex–other;  $p < 0.05$ ). Both twins were delivered vaginally (V–V) in most of the cases (61.43 %). In two cases, second twin was delivered by emergency cesarean section after vaginal delivery of the first twin (V–C) due to cord prolapse in one case and fetal distress in another case. Among those two cases, one second twin died, and the other was alive. Perinatal mortality of the second twin was more than four times higher in the V–V group (51.17 %) than that in the C–C (both delivered by cesarean section) group (12 %). Statistically significant association was found between the mode of delivery and the perinatal outcome of the second twin ( $p < 0.01$ ). More than 60 % (62.86 %) second twins had LBW (1500–<2500 g), and 17.14 % had very LBW (VLBW; <1500 g). Only 20 % had normal birth weight ( $\geq 2500$  g). These proportions were 57.14, 15.72, and 27.14 % in case of first twins. Among the second twins, the lowest birth weight recorded was 1000 g, and the highest was 2720 g. Perinatal mortality of the second twin was three times higher among LBW (<2500 g) babies (42.86 %) than normal birth weight ( $\geq 2500$  g) babies (14.29 %), and this difference was found to be statistically associated ( $p < 0.05$ ). Growth discordance (birth weight difference between first and second twins  $\geq 20$  %) was present only in 7.15 % (5) of twin sets, among which one second twin died. Perinatal outcome of the second twin was not associated with the birth weight difference between first and second twins.

**Table 1** Perinatal outcome of the second twin according to maternal characteristics ( $n = 70$ )

Maternal characteristics	Total nos.	Perinatal outcome of second twin		Statistical value, significance
		Alive	Dead	
Maternal age (years)				
<20	13 (18.57 %)	10 (76.92 %)	3 (23.08 %)	$\chi^2 = 1.35$ , df = 1
$\geq 20$	57 (81.43 %)	34 (59.64 %)	23 (40.36 %)	$p > 0.05$ , non-significant
Gravidity				
Primigravida	22 (31.43 %)	18 (81.81 %)	4 (18.19 %)	$\chi^2 = 4.94$ , df = 1
Multigravida	48 (68.57 %)	26 (54.17 %)	22 (45.83 %)	$p < 0.05$ , significant
No. of antenatal visits (in this hospital)				
0	9 (12.86 %)	3 (33.33 %)	6 (66.67 %)	$\chi^2 = 21.51$ , df = 2
1–<3	20 (28.57 %)	6 (30.00 %)	14 (70.00 %)	$p < 0.001$ , significant
$\geq 3$	41 (58.57 %)	35 (85.37 %)	6 (14.63 %)	

**Table 2** Perinatal outcome of the second twin according to fetal/neonatal characteristics ( $n = 70$ )

Fetal/neonatal characteristics	Total nos.	Perinatal outcome of second twin		Statistical value, significance
		Alive	Dead	
Gestational age at birth (weeks)				
<37 (Preterm)	45 (64.28 %)	23 (51.11 %)	22 (48.89 %)	$\chi^2 = 7.45$ , df = 1
$\geq 37$ (Term)	25 (35.72 %)	21 (84.00 %)	4 (16.00 %)	$p < 0.01$ , significant
Fetal presentation during labor and delivery				
Vertex–vertex	40 (57.14 %)	20 (50.00 %)	20 (50.00 %)	$\chi^2 = 6.71$ , df = 2
Vertex–nonvertex	18 (25.72 %)	14 (77.78 %)	4 (22.22 %)	$p < 0.05$ , significant
Nonvertex–other	12 (17.14 %)	10 (83.33 %)	2 (16.67 %)	
Mode of delivery				
Both vaginal (V–V)	43 (61.43 %)	21 (48.83 %)	22 (51.17 %)	$\chi^2 = 10.56$ , df = 2
Both CS (C–C)	25 (35.71 %)	22 (88.00 %)	3 (12.00 %)	$p < 0.01$ , significant
First vaginal, second CS (V–C)	2 (2.86 %)	1 (50.00 %)	1 (50.00 %)	
Birth weight of second twin (g)				
<2500 (Low)	56 (80.00 %)	32 (57.14 %)	24 (42.86 %)	$\chi^2 = 3.91$ , df = 1
$\geq 2500$ (Normal)	14 (20.00 %)	12 (85.71 %)	2 (14.29 %)	$p < 0.05$ , significant
Birth weight difference between first and second twins				
<20 % (Non-discordant)	65 (92.85 %)	40 (61.53 %)	25 (38.47 %)	$\chi^2 = 0.69$ , df = 1
$\geq 20$ % (Growth discordant)	5 (7.15 %)	4 (80.00 %)	1 (20.00 %)	$p > 0.05$ , non-significant

**Table 3** Distribution of different causes of perinatal mortality among the twins

Causes of perinatal mortality	First twin ( $n = 15$ )	Second twin ( $n = 26$ )
Prematurity	4 (26.66 %)	8 (30.77 %)
Severe birth asphyxia (Apgar score at 5 min $\leq 3$ )	4 (26.66 %)	6 (23.07 %)
Neonatal septicemia	3 (20.00 %)	5 (19.23 %)
Neonatal hyperbilirubinemia	2 (13.34 %)	3 (11.54 %)
Unexplained cause (stillbirth)	–	1 (3.85 %)
Very low birth weight (<1500 g)	2 (13.34 %)	3 (11.54 %)

Table 3 shows the distribution of different causes of perinatal mortality among the twins. Perinatal mortality was found in higher proportion among the second twins

than the first twins (37.14 vs. 21.43 %). Prematurity (30.77 %) and severe birth asphyxia (Apgar score at 5 min  $\leq 3$ ; 23.07 %) were the two most common causes of

perinatal mortality among the second twins. In a case of stillbirth at 36 weeks of gestation, the specific cause of death was unknown.

## Discussion

The present study attempts to document the perinatal outcome of the second twin in a tertiary care center in India. The lowest percentage of twin pregnancy was noted in the 30 years or older age group. Our observation does not support the earlier documentation that advancing age of the mother is responsible for increased incidence of twins [8]. Maternal age was not found to be associated with the perinatal outcome of the second twin. A unified picture on this relationship does not exist yet [9–12]. In this regard, the contribution of other factors, e.g., ART is worth studying.

The proportion of multigravida women was more than two times higher than that of primigravida women, which corroborates with a study from Pakistan [13]. Increased parity is known to increase the risk of dizygotic twins [8]. However, correlating the parity with the perinatal outcome of the second twin remains to be a challenge. In this study, perinatal outcome of the second twin was unfavorable among multigravida women compared to their primigravida counterparts. This observation is in contrast to other studies [14, 15].

Nine unbooked cases were referred from other government lower tiered hospitals or private health care at the third trimester of pregnancy for improved management. Perinatal mortality of the second twin was 66.67 % among them. Analysis of the present study findings indicates that women with frequent antenatal visits at regular intervals ( $\geq 3$ ) had favorable perinatal outcome of the second twin. Owen et al. [16] had a similar observation. These women usually develop less complications of twin pregnancy as regular antenatal check-ups give the opportunity of early detection and management of complications. Multiple pregnancies warrant intensive monitoring and frequent antenatal visits [17]. Fetal ultrasound surveillance should be performed to monitor growth and well-being at a frequent interval.

Gestational age is one of the major determinants of perinatal outcome of the second twin. Most of the women (64.28 %) delivered preterm. Refuerzo et al. [18] in the US and Schaaf et al. [19] in the Netherlands reported an almost similar observation. In our study, significantly higher perinatal mortality was observed in case of preterm birth in contrast to term birth. This finding supports that of Refuerzo et al. [18]. Preterm birth is the principal factor contributing to perinatal morbidity and mortality in twin pregnancy [19].

Intrapartum management of twins is strongly influenced by their presentations in labor [20]. Our observation regarding the distribution of fetal presentations is consistent with that of other studies [21, 22]. Perinatal outcome of the second twin was unfavorable in vertex–vertex presentation than that in other two presentations. This observation differs from that of Caulkwell and Murphy [22]. It remains ambiguous as to whether the fetal presentation affects the perinatal outcome. In this regard, it is necessary to find out the contribution of mode of delivery in this relationship.

An integral part of preparing for delivery in case of twin pregnancy is the confirmation of presentation so that the route of delivery can be decided. In this study, the rate of C–C delivery was 35.71 %, and that of V–C delivery was 2.86 %. The reported rates of V–C delivery range from 4.4 to 10.1 % [23–25]. In the present study, perinatal mortality of the second twin was unfavorable in the V–V group, and it was highly favorable in the C–C group. Our observation is supported by the other studies [26, 27]. It can be concluded that the mode of delivery is a significant predictor of perinatal outcome. However, whether it is the presentation or the mode of delivery that affects the perinatal outcome is not quite conclusive, as conflicting reports are available in the literature [28, 29].

Twin pregnancy is more likely to be characterized by LBW than singleton pregnancy mostly due to fetal growth restriction and preterm delivery [30]. The percentages of VLBW ( $< 1500$  g) and LBW ( $1500$ – $< 2500$  g) babies were higher among the second twins compared to the first twins. We also observed that perinatal outcome of the second twins was unfavorable among LBW ( $< 2500$  g) babies than normal birth weight ( $\geq 2500$  g) babies. Other studies also support our findings [31, 32].

In this study, growth discordance was noted only in 5 (7.15 %) cases, out of which 4 were born preterm. A study from Pakistan [33] showed nearly similar results. In our study, statistical association was not found between the inter-twin birth weight difference and the perinatal outcome. This observation does not corroborate with the study from Pakistan [33]. However, studies from the developed world do not give a clear picture on this issue [34, 35].

Both maternal and perinatal complications increase in twin pregnancy compared with singleton pregnancy. Most common maternal complication noted was preterm labor (64.28 %). Other complications encountered were preeclampsia, antepartum hemorrhage, preterm labor, preterm premature rupture of membrane, and cord prolapse. The fetal complications noted were prematurity, intrauterine growth restriction, and growth discordance. Neonatal complications were observed in higher proportion among the second twins than the first twins (77.14 vs. 47.14 %). Birth asphyxia (Apgar score at 5 min  $\leq 6$ ) was the most common complication observed among the second twins



(22.85 %). Other complications noted were VLBW, neonatal hyperbilirubinemia, neonatal septicemia, need for mechanical ventilation, neonatal seizure, and birth trauma.

The major factors influencing the perinatal mortality in twin pregnancy are the consequences of the high rate of prematurity. We found some common causes of perinatal mortality such as prematurity, severe birth asphyxia, neonatal septicemia, neonatal hyperbilirubinemia, and VLBW. Perinatal mortality was found in higher proportion among the second twins than the first twins (37.14 vs. 21.43 %).

The limitations of this study were small sample size and self-imposed restriction to certain selected variables that could potentially affect the perinatal outcome. However, regardless of its limitations, the present study contributes to the existing body of knowledge by establishing the Indian data on perinatal outcome of the second twin.

The study findings emphasize the importance of appropriate management protocols directed towards counseling, frequent and regular antenatal check-ups, early admission of mothers, and proper care during intrapartum and immediate postpartum periods. Second twins should be managed more carefully during intranatal and early neonatal periods. Twin pregnancy can be effectively managed in a tertiary health care facility to optimize maternal and fetal care for improving perinatal outcome.

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## References

1. Aziz S, Soomro N. Twin births and their complications in women of low socioeconomic profile. *J Pak Med Assoc.* 2012;62:1204–8.
2. Smits J, Monden C. Twinning across the developing world. *PLoS One* 2011;6:e25239. doi:10.1371/journal.pone.0025239 (Epub 28 Sep 2011).
3. The ESHRE Capri Workshop Group. Multiple gestation pregnancy. *Hum Reprod.* 2000;15:1856–64.
4. Dutta DC. Text book of obstetrics including perinatology and contraception. 6th ed. Calcutta: New Central Book Agency (P) Ltd.; 2004.
5. Prins RP. The second-born twin: can we improve outcomes? *Am J Obstet Gynecol.* 1994;170:1649–56.
6. Young BK, Suidan J, Antoine C, et al. Differences in twins: the importance of birth order. *Am J Obstet Gynecol.* 1985;151:915–21.
7. Eskes TK, Timmer H, Kollee L, et al. The second twin. *Eur J Obstet Gynecol Reprod Biol.* 1985;19:159–66.
8. Hoekstra C, Zhao ZZ, Lambalk CB, et al. Dizygotic twinning. *Hum Reprod Update.* 2008;14:37–47.
9. Blickstein I, Goldman RD, Mazkereth R. Maternal age and birth weight characteristics of twins born to nulliparous mothers: a population study. *Twin Res.* 2001;4:1–3.
10. Zhang J, Meikle S, Grainger DA, et al. Multifetal pregnancy in older women and perinatal outcomes. *Fertil Steril.* 2002;78:562–8.
11. Branum AM, Schoendorf KC. The influence of maternal age on very preterm birth of twins: differential effects by parity. *Paediatr Perinat Epidemiol.* 2005;19:399–404.
12. Delbaere I, Verstraelen H, Goetgeluk S, et al. Perinatal outcome of twin pregnancies in women of advanced age. *Hum Reprod.* 2008;23:2145–50.
13. Rizwan N, Abbasi RM, Mughal R. Maternal morbidity and perinatal outcome with twin pregnancy. *J Ayub Med Coll Abbottabad.* 2010;22:105–7.
14. Hannoun A, Usta IM, Awwad J, et al. Effect of parity on maternal and neonatal outcomes in twin gestations. *Acta Obstet Gynecol Scand.* 2012;91:117–21.
15. Tarter JG, Khoury A, Barton JR, et al. Demographic and obstetric factors influencing pregnancy outcome in twin gestations. *Am J Obstet Gynecol.* 2002;186:910–2.
16. Owen DJ, Wood L, Neilson JP. Antenatal care for women with multiple pregnancies: the Liverpool approach. *Clin Obstet Gynecol.* 2004;47:263–71.
17. National Collaborating Centre for Women's and Children's Health (UK). Multiple pregnancy: the management of twin and triplet pregnancies in the antenatal period. NICE (National Institute for Health and Clinical Excellence) Clinical Guideline, No. 129. London: RCOG Press; 2011. <http://www.nice.org.uk/nicemedia/live/13571/56422/56422.pdf>. Accessed 15 Jan 2014.
18. Refuerzo JS, Momirova V, Peaceman AM, et al. Neonatal outcomes in twin pregnancies delivered moderately preterm, late preterm, and term. *Am J Perinatol.* 2010;27:537–42.
19. Schaaf JM, Mol BW, bu-Hanna A, et al. Trends in preterm birth: singleton and multiple pregnancies in the Netherlands, 2000–2007. *BJOG.* 2011;118:1196–204.
20. Robinson C, Chauhan SP. Intrapartum management of twins. *Clin Obstet Gynecol.* 2004;47:248–62.
21. Wolff K. Excessive use of caesarian section for the second twin? *Gynecol Obstet Investig.* 2000;50:28–32.
22. Caulkwell S, Murphy DJ. The effect of mode of delivery and gestational age on neonatal outcome on the non-cephalic presenting second twin. *Am J Obstet Gynecol.* 2002;187:1356–61.
23. Suzuki S. Risk factors for emergency cesarean delivery of the second twin after vaginal delivery of the first twin. *J Obstet Gynaecol Res.* 2009;35:467–71.
24. Wen SW, Fung KF, Oppenheimer L, et al. Occurrence and predictors of cesarean delivery for the second twin after vaginal delivery of the first twin. *Obstet Gynecol.* 2004;103:413–9.
25. Ginsberg NA, Levine EM. Delivery of the second twin. *Int J Gynaecol Obstet.* 2005;91:217–20.
26. Hartley RS, Hitti J. Birth order and delivery interval: analysis of twin pair perinatal outcomes. *J Matern Fetal Neonatal Med.* 2005;17:375–80.
27. Smith GCS, Pell JP, Dobbie R. Birth order, gestational age, and risk of delivery related perinatal death in twins: retrospective cohort study. *BMJ.* 2002;325:1004–8.
28. Yang Q, Wen SW, Chen Y, et al. Neonatal mortality and morbidity in vertex–vertex second twins according to mode of delivery and birth weight. *J Perinatol.* 2006;26:3–10.
29. Peaceman AM, Kuo L, Feinglass J. Infant morbidity and mortality associated with vaginal delivery in twin gestations. *Am J Obstet Gynecol.* 2009;200:462.e1–6. doi:10.1016/j.ajog.2008.12.009.

30. Buekens P, Wilcox A. Why do small twins have a lower mortality rate than small singletons? *Am J Obstet Gynecol.* 1993;168:937–41.
31. Aisien AO, Olarewaju RS, Imade GE. Twins in Jos Nigeria: a seven-year retrospective study. *Med Sci Monit.* 2000;6:945–50.
32. Donovan EF, Ehrenkrantz RA, Shankaran S, et al. Outcomes of very low birth weight twins cared for in the National Institute of Child Health and Human Development Neonatal Research Network's intensive care units. *Am J Obstet Gynecol.* 1998;179:742–9.
33. Mazhar SB, Kanwal S. Twin birth weight discordance: associated factors and outcome. *J Coll Physicians Surg Pak.* 2010;20:391–4.
34. Hartley RS, Hitti J, Emanuel I. Size discordant twin pairs have higher perinatal mortality rates than nondiscordant pairs. *Am J Obstet Gynecol.* 2002;187:1173–8.
35. Patterson RM, Wood RC. What is twin birth weight discordance? *Am J Perinatol.* 1990;7:217–9.