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Impact of intertwin interval on short-term neonatal outcomes of the second twin in dichorionic pregnancies with vaginal delivery

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Synopsis: Second twins with an intertwin interval of 10 minutes or longer are more likely to have lower Apgar scores and arterial blood pH below 7.15.

ABSTRACT

Objective: To examine the effect of intertwin interval on umbilical cord pH and Apgar scores of the second twin after vaginal delivery.

Methods: A retrospective study of twin deliveries at a university hospital in Spain between August 2012 and September 2017. Inclusion criteria were vaginal delivery of both twins at 32 gestational weeks or more. Exclusion criteria were monochorionic pregnancies and indication for cesarean delivery. The sample was dichotomized by intertwin interval (<10 and ≥10 minutes). Neonatal outcomes including Apgar scores and umbilical cord pH were evaluated.

Results: Overall, 323 twin deliveries were included. Intertwin interval was less than 10 minutes in 277 (85.6%) cases, and 10 minutes or longer in 46 (14.2%). There were no differences in maternal or obstetric characteristics between the groups. Incidence of instrumental delivery (P<0.001) and internal podalic version (P<0.001) for the second twin was higher in the longer interval group. A longer interval was associated with higher frequencies of 1-minute Apgar score below 4 (P=0.009), 5-minute Apgar score below 7 (P<0.001), and umbilical cord pH below 7.15 (P<0.001).

Conclusion: Second twins with an intertwin interval of 10 minutes or longer are more likely to have poorer Apgar scores and arterial blood pH below 7.15.

1 INTRODUCTION

Twin pregnancies, as compared with single gestations, are associated with a higher risk of intrapartum complications, poorer neonatal outcomes, and higher perinatal morbidity and mortality [1-2]. Management of delivery of the second twin after vaginal delivery of the first twin remains a challenge in obstetric practice.

An aspect of concern for obstetricians managing a twin delivery is the intertwin interval. During this time period, there is an increased risk of complications such as placental abruption and cord prolapse that might worsen the prognosis for the second twin [3,4].

Several studies have assessed the impact of intertwin delivery on neonatal outcomes with conflicting conclusions. Some studies suggest that the intertwin interval should be as short as possible and that the second twin should be delivered within 15–30 minutes of the first twin [5,6]. By contrast, earlier studies concluded that, in cases of uncomplicated twin delivery with normal fetal monitoring, it is not necessary to impose a limit on the delivery interval between twins [7,8].

The aim of the present study was to determine whether an intertwin interval of 10 minutes or longer is associated with poorer short-term neonatal outcomes for the second twin.

2 MATERIALS AND METHODS

The present observational and retrospective cohort study assessed data from twin deliveries at a tertiary university teaching hospital, Hospital Universitario Materno-Infantil Miguel Servet, Zaragoza, Spain, from August 1, 2012, to September 30, 2017. Study approval was obtained from the Medical Records Department of the study hospital and from the Clinical Research Ethics Committee of Aragon. During ultrasound screening of the second trimester, all patients signed an informed consent form allowing the use of ultrasound images and obstetric data for research purposes.

The inclusion criteria were dichorionic twin gestations of at least 32 gestational weeks with cephalic presentation of the first twin and both fetuses alive, vaginal delivery of both twins, and no contraindication for vaginal delivery. The exclusion criteria were monochorionic gestations, indication for cesarean delivery for both twins (nonvertex presentation of the first twin or any contraindication for vaginal delivery), fetal distress, intrauterine death of either one of the twins before onset of labor, or second twin delivered by cesarean after vaginal delivery of the first twin.

Regarding the prenatal care of twin pregnancies at the study center, women have scheduled clinic visits every 4 weeks until 32 gestational weeks, and then weekly visits are recommended. Ultrasound examinations are performed at every visit to confirm adequate fetal wellbeing and the absence of congenital anomalies in accordance with international recommendations on prenatal care of twin pregnancies. If a risk factor is observed, more comprehensive obstetric care is offered, depending on the type of clinical risk factor.

Women with twin pregnancies of 32 gestational weeks or more, estimated fetal weight of more than 1500 g, and a vertex presentation of the first twin are allowed a trial of labor if there are no contraindications, regardless of the presentation of the second twin. In cases with no formal contraindication for vaginal delivery, labor is induced at 38 gestational weeks.

Regarding delivery management, the study hospital has a strong commitment to reducing the risks in twin deliveries. When a women with a twin pregnancy is admitted to the maternity ward with intended vaginal delivery, the following actions are taken to ensure maternal and fetal wellbeing during the process. First, two obstetricians and two pediatricians must be in the operating room, and all staff are prepared to perform a cesarean delivery if necessary. Second, ultrasound is routinely used to determine the exact presentation of the second twin and facilitate planning. Third, in cases of nonvertex presentation of the second twin, an internal podalic version or a breech extraction is performed depending on fetal presentation and then the amniotic membranes are ruptured.

For the present study, obstetric records were reviewed to obtain maternal and fetal information. Data on maternal characteristics such as obstetric and medical history, age, and race, use of assisted reproduction techniques, and maternal complications or fetal morbidities during the current pregnancy were collected. Regarding perinatal outcomes, information on the time interval between the twin deliveries, Apgar scores, and umbilical cord arterial pH was collected.

Women who met the inclusion criteria were divided into two groups in accordance with the time interval between the delivery of each twin: less than 10 minutes, and 10 minutes or longer. The cutoff of 10 minutes was determined as the 90th centile of the study sample.

Data analysis was performed by using SPSS version 21.0 (IBM, Armonk, NY, USA). Normal quantitative variables were expressed as mean ± SD, and non-normal variables as median (interquartile range). Qualitative variables were expressed as percentages. Differences in categoric variables were compared by χ^2 test, and quantitative variables by Student *t* and Mann–Whitney U test. A *P* value of less than 0.05 was considered to be statistically significant.

3 RESULTS

During the study period, the study center attended 20 222 deliveries, of which 658 (3.25%) were twin pregnancies. The frequency of vaginal delivery among twin pregnancies was 53.7%, whereas the overall frequency of cesarean delivery was 15.22%. Owing to the appropriate selection of twin pregnancies for intended vaginal delivery and the presence of an experienced obstetric team on standby for second twin extraction, cesarean delivery of the second twin after vaginal delivery of the first twin was a rare occurrence (n=6).

Of the 658 twin pregnancies delivered during the study period, 323 (49.8%) met the inclusion criteria (Figure 1). The demographic and obstetric characteristics of the pregnancies stratified by intertwin delivery interval (<10 minutes and ≥10 minutes) are summarized in Table 1. There were no differences in maternal and demographic parameters between the two groups. Figure 2 shows the distribution of intervals for delivery of the second twin in the two groups.

In terms of delivery parameters, the first twin had a normal vaginal delivery in 227 (70.3%) cases, and an assisted vaginal delivery in 96 (29.7%) cases. Regarding delivery of the second twin, women with an interval of 10 minutes or longer had a higher incidence of instrumental delivery (37.0% vs 1.4%; *P*<0.001) and were more likely to require an internal podalic version (odds ratio, 7.08; 95% confidence interval, 2.51–19.97) for second twin extraction as compared with those with an interval of less than 10 minutes. There was no difference in the frequency of breech delivery or breech extraction between the two groups. The distribution of the different modes of second twin delivery is summarized by group in Table 2.

Overall, women with a longer intertwin interval were more likely to deliver a second twin with a 1-minute Apgar score of less than 4, a 5-minute Apgar score of less than 7, and an umbilical cord arterial pH of less than 7.15 (Table 3).

4 DISCUSSION

The present study found that an intertwin interval of 10 minutes or longer was associated with a higher incidence of lower Apgar scores at 1 and 5 minutes of evaluation and a higher frequency of an umbilical cord arterial pH below 7.15 for the second twin.

A gestational age of 32 weeks at delivery was chosen as the cutoff for inclusion in the study on the basis of a large trial published by Barret et al. [9] in 2013, which concluded that for twin gestations at 32–38 weeks with the first twin in cephalic presentation, cesarean delivery did not decrease the risk of fetal or neonatal morbidity as compared with planned vaginal delivery.

The present results are in agreement with several studies reporting that a longer time interval is related to a lower Apgar score at 1, 5, and 10 minutes, and a lower mean umbilical pH [5, 10-12]. An intertwin interval more than 30 minutes has also been associated with a worsening in arterial and venous umbilical cord pH, partial pressure of CO_2, and base excess, leading to an increased risk of fetal distress and acidosis in the second twin [5].

It should be noted that, at the study hospital, women with uncomplicated twin pregnancies are routinely offered a trial of labor and active management of second twin including breech extraction and internal version if necessary. This is possible because the obstetricians have extensive experience of managing twin deliveries, and is reflected in the high frequency of breech extraction and internal version in both groups. This might explain why the intertwin intervals in the present study are significantly shorter than those reported in similar studies.

Active management of second twin delivery based on breech extraction of a second nonvertex twin or internal version of a nonengaged cephalic second twin has been associated with a low frequency of cesarean delivery of the second twin (0.5%) [1,13]. Other studies found that, without active management of second twin delivery, combined vaginal–cesarean delivery occurred in 6.3%–9.5% of cases [14,15]. The main factors associated with an increased risk of cesarean delivery of the second twin after vaginal delivery of the first twin in those studies were fetal distress and cord prolapse.

The prevalence of nonvertex presentation of the second twin is high. In the present cohort, 112 (34.7%) second twins were in nonvertex presentation. Breech deliveries are known to have worse short-term neonatal outcomes in terms of Apgar score and umbilical cord arterial pH [16]; however, such poorer short-term neonatal outcomes were not found to influence neurodevelopmental delay in a 2-year follow-up study [17]. Although the results of Apgar tests and umbilical cord pH may be lower for nonvertex second twins, the implications of these findings need to be assessed in future studies of long-term outcomes.

The strengths of the study include its sample size, which is one of the largest reporting twin delivery intervals, and the fact that management of twin delivery at the study center is standardized and follows a unit protocol. In addition, the center has extensive experience in managing twin deliveries and the obstetricians are trained to perform intrauterine maneuvers such as breech extraction and internal version.

The study has some limitations, including the possibility of bias as a result of its retrospective design. The data were retrieved from a database, which carries the risk of both underreporting and incorrect reporting. Nevertheless, each medical file was thoroughly reviewed to minimize inaccuracies. Another limitation is that the Apgar test score was not available for 10 second twins and umbilical cord pH was not collected for 36 second twins. Nevertheless, it is important to clarify that data on at least one short term neonatal outcome (umbilical cord pH or Apgar test score) were available for every second twin.

In summary, the present findings suggest that an intertwin interval of 10 minutes or longer might be associated with a lower 1- and 5-minute Apgar score, and a higher frequency of arterial blood pH below 7.15 for the second twin. Active management of labor after delivery of the first twin, and training of obstetricians in breech extraction and internal version seem to play a key role in the management of twin deliveries. Thus, for selected and well-informed populations, this management is appropriate. Further studies are required to confirm the value of setting a time limit on the intertwin delivery interval.

Author contributions

MBV contributed to project development, data collection, data analysis, and manuscript writing and revision. CDBT contributed to literature review, data analysis, and manuscript writing and revision. AAO contributed to literature review, data acquisition, and manuscript writing. MRA contributed to data acquisition and interpretation, and manuscript revision. JMCM and SCM contributed to study design and manuscript revision.

Conflicts of interest

The authors have no conflicts of interest.

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Figure legends

Figure 1 Flow chart showing the study population.

Figure 2 Distribution of intertwin interval in the two study groups.

Table 1 Demographic and obstetric characteristics of the study population [a]

Characteristic	ITI <10 min (n=277)	ITI ≥10 min (n=46)	OR (95% CI)	*P* value
GA at delivery, wk	37 (34-41)	37 (34-39)		0.258
32–34	53 (19.2)	7 (15.2)	0.76 (0.32–1.79)	0.527
35–37	79 (28.5)	10 (21.8)	0.71 (0.33–1.50)	0.365
>37	145 (52.3)	29 (63.0)	0.75 (0.40–1.41)	0.374
White	253 (91.3)	40 (87.0)	1.58 (0.61–4.10)	0.343
Prior cesarean delivery	12 (4.3)	1 (2.2)	0.49 (0.06–3.87)	0.490
Nulliparity	191 (69.0)	36 (78.3)	0.62 (0.29–1.30)	0.201
Hypertensive disorders	23 (8.3)	5 (10.9)	1.35 (0.48–3.74)	0.567
Gestational diabetes	33 (11.9)	8 (17.4)	1.56 (0.67–3.62)	0.301
Prenatal steroids	96 (34.7)	11 (23.9)	0.59 (0.29–1.22)	0.152
Second twin presentation			0.90 (0.46–1.74)	0.751
Vertex	180 (65.0)	31 (67.4)		
Nonvertex	97 (35.0)	15 (32.6)		
Birthweight, g				
First twin	2346 ± 414	2448 ± 397		0.401
Second twin	2295 ± 409	2556 ± 432		0.281

Abbreviations: CI, confidence interval; GA, gestational age; ITI, intertwin interval; OR, odds ratio.

[a] Values are given as mean ± SD, median (interquartile range), or number (percentage).

Table 2 Type of delivery of the second twin by intertwin interval [a].

Delivery	ITI <10 min (n=277)	ITI ≥10 min (n=46)	OR (95% CI)	*P* value
Spontaneous	173 (62.5)	10 (21.7)	5.99 (2.85–12.57)	<0.001
Instrumental	4 (1.4)	17 (37.0)	40.01 (12.61–16.92)	<0.001
Breech	12 (4.3)	3 (6.5)	1.54 (0.42–5.68)	0.513
Breech extraction	80 (28.9)	8 (17.4)	0.52 (0.23–1.16)	0.105
Internal podalic version	8 (2.9)	8 (17.4)	7.08 (2.51–19.97)	<0.001

Abbreviations: CI, confidence interval; ITI, intertwin interval; OR, odds ratio.

[a] Values are given as number (percentage).

Table 3 Neonatal outcomes of the second twin [a].

Outcome [b]	ITI <10 min (n=277)	ITI ≥10 min (n=46)	OR (95% CI)	*P* value
Median 1-minute Apgar score σ	9 (3-10)	8 (4-10)		0.001
Mean 5-minute Apgar score σ	10 (6-10)	9 (5-10)		0.004
Umbilical cord pH	7.27 ± 0.66	7.15 ± 0.52		0.011
1-min Apgar score <4	3 (1.1)	3 (6.5)	6.67 (1.30–34.22)	0.009
5-min Apgar score <7	1 (0.4)	3 (6.5)	20.17 (2.05–198.71)	<0.001
Umbilical cord pH <7.15	19 (6.9)	18 (39.1)	9.35 (4.31–20.28)	<0.001

Abbreviations: CI, confidence interval; ITI, intertwin interval; OR, odds ratio.

[a] Values are given as mean ± SD, median (interquartile range) or number (percentage).

[b] Data were missing for 10 neonates (1-minute Apgar score), 10 neonates (5-minute Apgar score) and 36 neonates (umbilical cord arterial pH).

Figure 1.

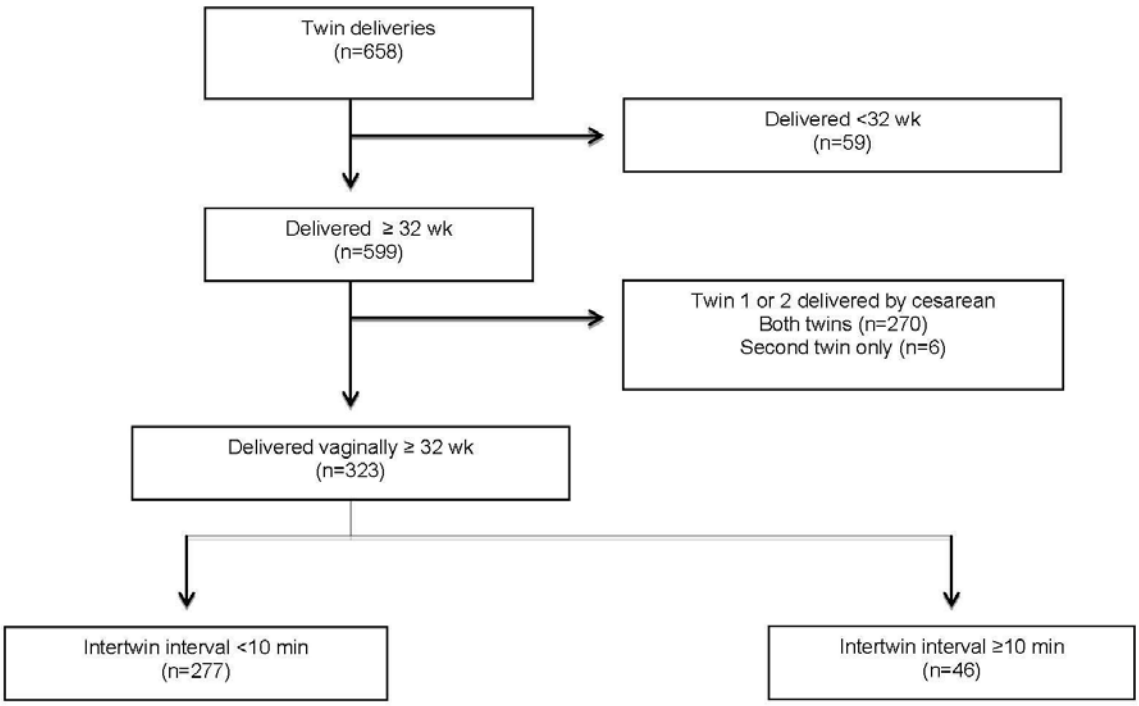

Figure 2. Distribution of intertwin interval in both groups