



Neonatal and Maternal Outcomes in Spontaneously-Conceived Twin Pregnancies According to Mode of Delivery

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Abstract

Introduction: Appropriate intrapartum conduct in a twin delivery remains a challenging aspect of obstetric practice. The objective of this study was to compare neonatal and maternal outcomes in twin pregnancies according to mode of delivery.

Materials and methods: This is a single centre retrospective cohort study of all consecutive spontaneously-conceived twin deliveries (≥ 24 weeks, estimated fetal weight ≥ 500 grams) over a nine-year period between 01/01/2007 - 31/12/2016 at a tertiary-level centre. Neonatal outcomes included survival, APGAR score, prematurity-associated pathology (PAP), admission to the neonatal intensive care unit (NICU) and length of stay (LOS). Maternal outcomes included postpartum complications and LOS. Statistical analysis comprised Chi-square test with subsequent *p*-value and odds-ratio with 95% confidence interval. Statistical significance was set at *p* < 0.05.

Results: A total of 173 consecutive women with spontaneously-conceived twin deliveries were enrolled in this study, 129 (74.6%) women delivered by caesarean section (CS). The success rate of vaginal delivery (VD) was 93.6% (44/47). A strong statistical correlation was identified between CS and NICU admission; 53.2% vs. 1.5% (*p*=0.0001). Neonatal LOS in the NICU was significantly longer in the CS group. Prematurity-associated pathology (PAP) was noted in 75 pairs of twins (75/173); 61 pairs were delivered by CS, bearing strong statistical significance (*p*<0.0001). Postpartum complications occurred in 14.7% of CS compared to 13.6% of VDs.

Conclusion: Neonates delivered by CS had a higher rate of PAP, NICU admission, lower birth weight and longer LOS. This study showed that VD is safe, especially when the first twin is in cephalic presentation.

Keywords

caesarean, cohort study, spontaneous conception, twins, vaginal

INTRODUCTION

The prevalence of multiple pregnancies, especially twin pregnancies, continues to rise due to wider availability of in-vitro fertilisation (IVF).¹ In contrast, spontaneous conception of twins is a rarity compared to IVF conception, however, there is evidence that high consumption of red

meat and a maternal history of twin gestation are associated with spontaneous conception of twins.²

Conduct in a twin delivery continues to be one of the most challenging aspects of obstetric practice^{3,4} and the optimal mode of delivery remains elusive.⁵

There is an abundance of literature demonstrating that women carrying a twin pregnancy experience higher rates

of complications during pregnancy and delivery compared to their counterparts carrying a singleton pregnancy.⁶⁻¹⁰ This increase in complications is largely attributable to the higher incidence of premature delivery in twin pregnancies and its associated morbidity.⁷ Prematurity-induced morbidity encompasses respiratory distress syndrome, transient tachypnea of the newborn, neonatal seizures, persistent fetal circulation, necrotising enterocolitis and intraventricular haemorrhage, even when birth weight exceeds 2500 grams.^{11,12}

Twin pregnancies often culminate in caesarean section, fuelling the on-going debate regarding the optimal mode of twin delivery.^{9,13,14} The incidence of both short and long term maternal morbidity is increased following CS compared to vaginal delivery (VD). The main short-term complications include intra or postpartum haemorrhage and infection, while long-term complications of a scarred uterus comprise morbidly adherent placental disorders and uterine rupture.^{4,15-17}

No randomised controlled trials were successful in identifying the optimal mode and timing of delivery in twin pregnancies until 2013. Since then, the Twin Birth Study (TBS) provided pivotal evidence that neonatal outcomes following VD were superior to CS when the leading twin was in vertex presentation, at a minimum 32 weeks gestation and an experienced obstetrician was present at delivery.³ Although this study provided highly sought-after evidence, only a fraction of professional obstetrics societies worldwide have since included planned VD in twin pregnancy into their guidelines.^{18,19} The TBS also concluded that planned CS is safer than VD when the leading twin is breech as it reduces the risk of severe neonatal morbidity.³

The JUMODA study, a national prospective analysis of 5,915 women, concluded that composite neonatal morbidity and mortality was higher in the planned CS group.²⁰ Rossi et al.'s meta-analysis found that there was no difference in outcome of the second twin when both twins were in vertex presentation.²¹

The objectives of this study were to compare neonatal and maternal outcomes in twin deliveries according to mode of delivery.

MATERIALS AND METHODS

Over a nine-year period, between 2007 -2016, the medical records of all spontaneously-conceived twin deliveries (24+0 - 40+0 weeks gestation) at a single tertiary referral centre, were reviewed. Data comprising baseline maternal characteristics and maternal and neonatal outcomes were collected according to mode of delivery. Baseline characteristics encompassed demographics, obstetric history, gestational age, medical and pregnancy induced comorbidities, pregnancy-associated pathology and fetal characteristics (chorionicity, amnionicity, difference in estimated fetal weight (EFW)). Neonatal outcomes were centred around neonatal survival, APGAR score, prematurity-associated pathology, birth weight, admission to the neonatal intensive care unit (NICU) and length of stay (LOS). On the other hand, maternal outcomes focused primarily on early postpartum complications, which occurred whilst in hospital and LOS. Primary outcomes were neonatal and maternal morbidity. Statistical analysis encompassed Chi-square test with subsequent p-value and odds ratio with 95% confidence interval, carried out using GraphPad Prism 6[®] (GraphPad Inc., USA). Statistical significance was set at $p < 0.05$. All procedures were performed in compliance with relevant laws and institutional guidelines. Ethical approval of this study was waived since this analysis used existing records, based on information routinely collected, and subjects represented a de-identified data set.

RESULTS

Over the nine-year study period, a total of 279 women carrying a twin pregnancy were admitted. Of these 279 women, 106 were excluded; 41 conceived through in-vitro fertilisation, 10 experienced an abortion, while 55 delivered at another facility, yielding a final study population of 173 women, depicted in **Fig. 1**.

A total of 346 neonates were delivered; 334 live births, 11 cases of intrauterine fetal death (IUFD) and 8 neonatal deaths. One-hundred and twenty-nine (74.6%) women

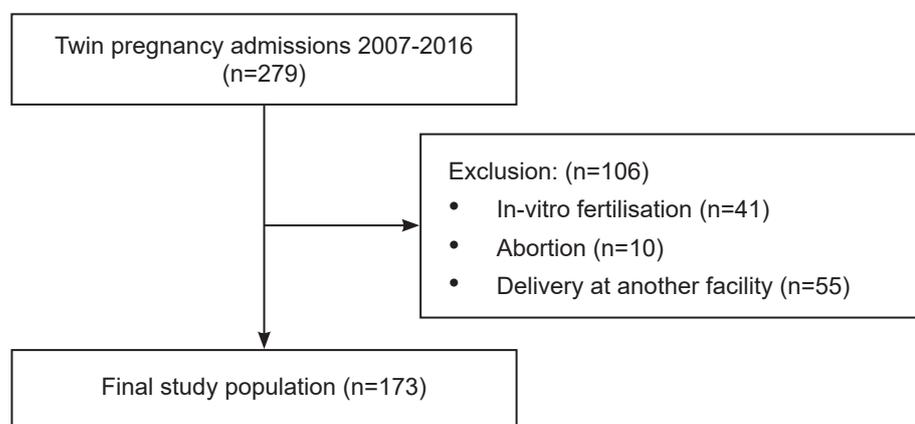


Figure 1. Flowchart of study population.

delivered by CS. Vaginal delivery was planned in 47 cases (54.3%). The success rate of VD was 93.6% (44/47). The mode of delivery for each pair of twins was the same in all but two (0.6%) cases. In both cases, the leading twins were delivered vaginally, while second twins were delivered by CS. Gestational age at delivery ranged between 24-40 weeks

with an average of 35.2±3.17 weeks.

Vaginal delivery was undertaken in 81.8% of IUFD cases (OR: 0.10, 95%CI: 0.02-2.42, $p=0.0015$). Moreover, there was a tendency to deliver extremely preterm neonates vaginally: 18.8% compared to 2.3% by CS (OR: 0.10, 95% CI: 0.02-0.47, $p=0.0015$), shown in **Table 1**.

Table 1. Delivery characteristics

Delivery characteristics	CS (n=129)	VD (n=44)	Odds Ratio	95% CI	p-value
Live birth					
Yes	123 (95.3%)	39 (88.6%)	0.38	0.11-1.31	0.12
No	6 (4.7%)	5 (11.4%)			
IUFD					
Yes	3 (2.3%)	8 (18.8%)	0.10	0.02-0.42	0.0015
No	126 (97.7%)	36 (81.8%)			
Neonatal death					
Yes	5 (3.9%)	3 (6.8%)	0.55	0.12-2.40	0.42
No	124 (96.1%)	41(93.2%)			
Gestational age at delivery (range)	25-40 (35.4)	24-40 (34.6)	-	-	-
Term delivery (≥ 37 weeks)					
Yes	58 (45%)	16 (36.4%)	0.69	0.34-1.41	0.32
No	71 (55%)	28 (63.6%)			
Late preterm (35-36 w)					
Yes	31 (24%)	14 (31.8%)	0.67	0.31-1.43	0.31
No	98 (76%)	30 (68.2%)			
Moderate preterm (32-34)					
Yes	25 (19.4%)	8 (18.8%)	1.08	0.44-2.61	0.86
No	104 (80.6%)	36 (81.8%)			
Very preterm (29-31)					
Yes	11 (8.5%)	1 (2.3%)	4.00	0.50-13.98	0.19
No	118 (91.5%)	43 (97.7%)			
Extremely preterm (24-28)					
Yes	3 (2.3%)	8 (18.8%)	0.10	0.02-0.42	0.0015
No	126 (97.7%)	36 (81.8%)			

Table 2. Mode of delivery according to gestational age

Gestational Age	CS (n=129)	VD (n=44)	Total	Odds Ratio	95% CI	p-value
24	0 (0%)	1 (100%)	1	0.11	0.0045-2.79	0.18
25	1 (33.3%)	2 (66.7%)	3	0.16	0.01-1.89	0.14
26	1 (50%)	1 (50%)	2	0.33	0.02-5.48	0.44
27	0 (0%)	1 (100%)	1	0.11	0.0045-2.79	0.18
28	1 (50%)	1 (50%)	2	0.33	0.02-5.48	0.44
29	2 (100%)	0 (0%)	2	0.67	0.05-7.65	0.75
30	3 (75%)	1 (25%)	4	1.02	0.10-10.10	0.98
31	6 (100%)	0 (0%)	6	4.68	0.25-84.86	0.29
32	8 (72.7%)	3 (27.3%)	11	0.90	0.22-3.56	0.88
33	6 (66.7%)	3 (33.3%)	9	0.66	0.15-2.78	0.57
34	12 (92.3%)	1 (7.7%)	13	0.44	0.55-34.94	0.16
35	11 (78.6%)	3 (21.4%)	14	0.11	0.01-1.14	0.06
36	20 (64.5%)	11 (35.5%)	31	0.55	0.23-1.26	0.15
37	27 (79.4%)	7 (20.6%)	34	1.39	0.56-3.48	0.47
38	24 (77.4%)	7 (22.6%)	31	1.20	0.48-3.03	0.68
39	6 (100%)	0 (0%)	6	4.68	0.25-84.86	0.29
40	1 (33.3%)	2 (66.7%)	3	0.06	0.01-1.85	0.14
	129	44	173	-	-	-

Table 2 depicts the lack of association between mode of delivery and any specific week of gestational age ($p>0.05$).

Baseline characteristics are displayed in **Table 3**.

Fetal presentation at delivery is outlined in **Table 4**; both twins in vertex presentation was most frequent, accounting for 27.7% of all twins.

Neonatal weight ranged between 600-3830 g with an average of 2258.3 ± 613.44 g. Leading twins weighed more than second twins: range: 615-3830 g, average: 2317 ± 625.37 g

compared to 600-3290, 2210 ± 599.16 g. One-third of all twins delivered weighed between 2000-2499 grams (**Table 5**).

The overall 1 minute APGAR scores ranged between 1 and 9 with an average of 7.61 ± 1.77 . Leading twins received higher 1 minute scores; range: 2-9, average: 7.8 ± 1.66 , compared to second twins: 1-9, 7.4 ± 1.86 .

Malpresentation of the leading twin and birth weight < 1500 g were predictors of CS (OR: 12.25, 95% CI: 3.61-

Table 3. Baseline characteristics according to mode of delivery

Maternal baseline characteristics	CS (n=129)	VD (n=44)	Odds Ratio	95% CI	p-value
Range, mean age	15-43, 28.4±5.73	16-37, 26.4±5.63	-	-	-
Age ≤ 18	7 (5.5%)	1 (2.3%)	2.46	0.29-20.63	0.40
Age ≥ 35	19 (14.7%)	4 (9.1%)	1.90	0.61-5.90	0.26
Parity					
Primiparous	71 (41%)	21 (47.7%)	1.34	0.67-2.66	0.40
Multiparous	58 (59%)	23 (52.3%)			
Chorionicity					
Monochorionic	28 (21.7%)	11(33%)	0.83	0.37-1.85	0.65
Dichorionic	101 (78.3%)	33 (75%)			
Pregnancy-associated pathology					
Yes	11 (8.5%)	1 (2.3%)	4.00	0.50-31.98	0.19
No	118 (91.5%)	43 (97.3%)			
Medical comorbidities					
Yes	25 (19.4%)	3 (6.8%)	3.28	0.94-11.47	0.06
No	104 (80.6%)	41 (93.2%)			

Table 4. Fetal presentation at delivery

Twin A	Twin B	Total, Percentage
cephalic	cephalic	48, 27.7%
cephalic	breech	33, 19.1%
cephalic	transverse	28, 16.2%
breech	cephalic	18, 10.4%
breech	breech	15, 8.7%
breech	transverse	12, 6.9%
transverse	cephalic	3, 1.7%
transverse	transverse	9, 5.2%
transverse	breech	7, 4.1%

41.61, $p=0.0001$), (OR: 0.29, 95% CI: 0.13-0.63, $p=0.0017$), respectively. Furthermore, a strong correlation was noted between delivery by CS and NICU admission: 53.2% vs. 1.5% (OR: 75.93, 95% CI: 9.36-6153.81, $p=0.0001$). Length of stay (LOS) in the NICU was significantly longer for neonates delivered by CS: range: 1-168 days, average: 22.78 days compared to 1-30, 12.05 days in their counterparts who were delivered vaginally (**Table 6**).

Seventy-five (43.3%) of the 173 twin pairs suffered from prematurity-associated pathology (PAP), of whom 61 (81.3%) were delivered by CS, demonstrating a strong statistical correlation between CS and PAP (OR: 18.98,

Table 5. Birth weight intervals according to mode of delivery

Birth Weight (g)	CS (n=129)	VD (n=44)	Total	Odds Ratio	95% CI	p-value
500-999	4 (57.1%)	3 (43.7%)	7 (4%)	0.43	0.09-2.03	0.29
1000-1499	7 (70%)	3 (30%)	10 (5.8%)	40.78	0.19-3.17	0.73
1500-1999	20 (66.7%)	10 (33.3%)	30 (17.3%)	0.62	0.26-1.46	0.27
2000-2499	42 (79.2%)	11 (20.8%)	53 (30.6%)	1.44	0.66-3.14	0.34
2500-2999	38 (73.1%)	14 (26.9%)	52 (30%)	1.11	0.45-2.69	0.81
3000-3499	13 (81.3%)	3 (18.7%)	16 (9.2%)	1.53	0.41-5.64	0.52
3500-3999	5 (100%)	0 (0%)	5 (3%)	3.93.	0.21-72.55	0.35
≥ 4000	0 (0%)	0 (0%)	0 (0%)	-	-	-
Total	129	44	173	-	-	-

95% CI: 8.34-43.16, $p < 0.0001$). Despite the overall higher rate of PAP in neonates delivered by CS, only apnoea crises achieved statistical significance ($p = 0.03$). Moreover, all types of PAP persisted longer in neonates delivered by CS, as depicted in **Table 7**.

A total of 25 postpartum complications occurred in 24

(13.9%) parturients. Some three-quarters of the complications occurred following CS, however without statistical significance (**Table 8**). Overall maternal LOS ranged between 3-83 days with an average of 14.7 days. Length of stay following CS ranged between 4-83 days, (average: 15.65 days) compared to 3-38 days (average: 12.13 days) following VD.

Table 6. Neonatal characteristics according to mode of delivery

Neonatal Characteristics	CS (n=129)	VD (n=44)	Odds Ratio	95% CI	p-value
APGAR score 7-10	114 (88.5%)	38 (86.3%)	3.28	0.94-11.47	0.06
APGAR score 4-6	9 (7.1%)	5 (11.4%)	0.58	0.18-1.85	0.36
APGAR score 0-3	6 (4.4%)	1 (2.3%)	2.09	0.24-17.92	0.49
Malpresentation Twin A					
Yes	61 (47.3%)	3 (6.8%)	12.25	3.61-41.61	0.0001
No	68 (52.7%)	41 (93.2%)			
Birth weight					
<1500 g	20 (15.5%)	17 (38.4%)	0.29	0.13-0.63	0.0017
>1500 g	109 (84.5%)	27 (61.3%)			
AGA	93 (72.2%)	37 (84.1%)	0.48	0.19-1.19	0.11
SGA	16 (12.3%)	3 (6.8%)	1.91	0.53-6.98	0.31
LGA	20 (15.5%)	4 (9.1%)	1.83	0.59-5.69	0.29
NICU admission					
Yes	17 (53.2%)	1 (1.5%)	75.93	9.36-615.81	0.0001
No	15 (46.8%)	67 (98.5%)			
NICU LOS (range, average)	1-168, 22.7	1-30, 12.05	-	-	-
NICU LOS > 30 days	8 (38.1%)	2 (10.5%)	1.54	0.29-8.02	0.60
NICU LOS < 30 days (n=71)	44 (61.9%)	17 (89.5%)			

Table 7. Prematurity-associated pathology by mode of delivery

Type of prematurity-associated pathology	Range and average gestational age at CS	Range and average gestational age at VD	CS (n=129)	VD (n=44)	Total	p-value
Respiratory distress syndrome	25-36, 31.3	24-33, 29	26 (83.9%)	4 (16.1%)	31	0.10
Bronchopulmonary dysplasia	25-31, 29.6	N/A	7 (100%)	0 (0%)	7	0.24
Transient tachypnoea of the newborn	31-38, 35.1	30-32, 31	12 (75%)	4 (25%)	16	0.96
Pulmonary haemorrhage	28, 28	24-28, 26	1 (33.3%)	2 (66.7%)	3	0.14
Apnoea crises	25-36, 31.7	32-35, 33	42 (85.7)	7 (14.3%)	49	0.03
Pneumonia	26-36, 31	N/A	5 (100%)	0 (0%)	5	0.35
Intraventricular haemorrhage	31-35, 33	27-28, 27.5	6 (75%)	2 (25%)	8	0.97
Periventricular leukomalacia	32-33, 32.5	N/A	4 (100%)	0 (0%)	4	0.43
Necrotising enterocolitis	26-38, 32	28-32, 30	3 (75%)	1 (25%)	4	0.98
Retinopathy	25-35, 30.6	24-32, 29.3	20 (70%)	6 (30%)	26	0.76
Prematurity jaundice	24-38, 33.1	24-36, 32.5	78 (79.6%)	20 (20.4%)	98	0.14
Prematurity anaemia	25-38, 32.2	30-33, 32	55 (80.9%)	13 (9.1%)	68	0.12
Seizures	28-40, 35.8	N/A	13 (100%)	0 (0%)	13	0.10
Total	-	-	272 (81.9%)	33 (18.1%)	332	$p < 0.0001$

DISCUSSION

Appropriate intrapartum conduct in a twin delivery remains a challenging aspect of obstetric practice.^{3,4,19} This cohort study found that composite neonatal and maternal outcomes were superior with VD.

Prior to 2013, the tendency was to deliver twins by elective CS, mainly due to the high rate of malpresentation, featuring interlocked twins, as well as the risk of acute hypoxia in the second twin from decreased placental circulation and trauma to the premature fetal brain upon passage through the birth canal.²²

The success rate of planned VD ascertained in this study (93.6%) was higher compared to the rate reported in the Twin Birth Study (TBS): 56.2%³ and Ylilehto et al.'s study of 495 twin deliveries: 81%²³, however, it paralleled the success rate of Sadeh et al.'s study of 411 twin deliveries: 91%²⁴.

Of the 33 pairs of twins with the leading twin in breech and the second twin in either breech or vertex presentation, only two pairs (6.1%) were delivered vaginally. This result was most likely influenced by TBS which found that elective CS decreased neonatal morbidity from 5% to 1.6% when the leading twin was in non-vertex presentation.³

Of the eight cases of neonatal mortality, five (62.5%) occurred in neonates delivered by CS ($p=0.42$). This finding is consistent with the TBS's results³, however contradictory to Jhaveri et al.'s findings who reported three neonatal deaths of the second twin in premature twins delivered vaginally between 28-32 weeks gestation with extremely low birth weights. The proportion of low and critically-low APGAR scores in neonates delivered by CS was similar: 11.6% compared to 11.3% following VD. These findings coincide with those reported by Jhaveri et al. whose rate of neonatal morbidity in the planned vaginal group amounted to 23.8%, compared to 22.6% in the CS group.¹⁴

Birth weight was significantly lower among neonates delivered by CS ($p=0.0017$). A likely explanation for this phenomenon is the rationale of fetal protection against intracerebral haemorrhage during passage through the birth canal.²⁵ The TBS found that twins weighing ≥ 1500 g or above 32 weeks gestation delivered by planned VD did not

exhibit an increased rate of perinatal morbidity compared to their counterparts delivered by CS.

Zamarfand et al. elaborate that the impact of gestational age on composite perinatal outcome at gestations < 33 weeks as prematurity-induced morbidity may mask the effect of delivery mode compared to a term delivery.⁴ The authors also discuss the protective effect that VD exerts on twins delivered at earlier gestations than 33 weeks, resulting in a lower need for mechanical ventilation.⁴

A strong statistical correlation was identified between CS and neonatal intensive care unit (NICU) admission: 53.2% vs. 1.5% ($p=0.0001$). Moreover, neonatal LOS in the NICU was significantly longer in the CS group; range: 1-68 days, average: 22.78 days compared to the VD group: 1-30, 12.05 days). Prematurity-associated pathology (PAP) was noted in 75 pairs of twins (43.4%); 61 pairs (81.3%) were delivered by CS, bearing strong statistical significance ($p<0.0001$).

Postpartum complications occurred in 14.7% of CS compared to 13.6% of VD. The rate obtained in this study was higher than that of the TBS (7.3% vs. 8.5%). Maternal LOS was longer in women who delivered by CS; range: 4-83 days, average: 15.65 compared to 3-83, 12.13 following VD. The LOS reported in the current study is significantly longer compared to published rates as parturients are offered the choice of remaining in hospital during their twins' NICU stay.

There is a clear rise in rates of elective CS for twins worldwide despite the recommendations of the TBS.^{3,14} The risks and adverse outcomes associated with CS, mainly complications and extended hospital stay, should be carefully weighed up in the case of planned CS not indicated due to fetal distress. In the short-term, women who deliver via CS have a higher incidence of haemorrhage and infection, compared to morbidly adherent placenta and uterine rupture with a scarred uterus in the long term.^{4,15-17} Moreover, Reitter et al. are concerned that the rising trend of CS delivery of low-risk twins pregnancies worldwide will minimise obstetricians' exposure and skills in a twin VD, especially when there is no evident benefit to the mother or fetuses.¹⁸

Table 8. Types of postpartum complications encountered by mode of delivery

Type of postpartum complication	CS (n=129)	VD (n=44)	Odds Ratio	95% CI	p-value
SSI	7 (5.4%)	N/A	-	-	N/A
Postpartum haemorrhage	4 (3.1%)	1 (2.3%)	1.28	0.13-11.78	0.75
Endometritis	2 (1.6%)	0 (0%)	1.74	0.08-37.05	0.72
Hypogalactia	4 (3.1%)	0 (0%)	3.19	0.16-60.47	0.43
Seizures	1 (0.8%)	0 (0%)	1.03	0.04-25.97	0.98
Placental retention	N/A	4 (9.1%)	-	-	N/A
Respiratory desaturation	1 (0.8%)	0 (0%)	1.03	0.04-25.97	0.98
Episiotomy dehiscence	N/A	1 (2.3%)	-	-	N/A
Total	19 (76%)	6 (24%)	1.09	0.40-2.94	0.85

With regard to long-term paediatric outcomes in twins, Fox et al. published a prospective observational study comprising a cohort of 354 twins, aged 6, which showed that there was no difference in long-term paediatric outcomes between VD and CS delivery.²⁶

Management of delivery of the second twin remains a considerable challenge in obstetric practice. The inter-twin interval has a higher rate of complications including decreased placental perfusion, cord prolapse, and more rarely, placental abruption.^{22,27} Benito et al. concluded that second twins delivered after an inter-twin interval exceeding 10 minutes had poorer APGAR scores and higher rates of blood pH <7.15.²⁸

Current guidance advises that the inter-twin interval should not exceed 30 minutes as this causes poor perinatal outcomes secondary to acute hypoxia due to decreased placental perfusion.^{27,29} However, rare cases of extremely delayed inter-delivery intervals up to 131 days have been reported in the interest of delaying extremely premature deliveries.³

This study featured a case of intentional delayed delivery of the second twin 50 days after the leading twin. The patient was a gravida 4, para 2 (with a previous VD) whose delivery of dichorionic diamniotic twins was complicated by preterm premature rupture of membranes at 27 weeks. The leading twin was delivered in breech presentation, weighing 920 g, receiving an APGAR score of 6. The delivery of the second twin was delayed by 50 days, until 33 weeks, during which time a CS was performed due to redistribution phenomena. The second twin weighed 1870 g and received an APGAR score of 8.

The limitations of this study comprised a retrospective design and a small sample size due to a high number of women who delivered at another facility as well as an unequal proportion of the modes of delivery. Hence, further larger prospective multicentric studies are needed to conclude whether VD is safer than CS when the leading twin is in vertex presentation. Another limitation comprised the lack of data on neonatal blood pH as this is not a departmental practice for neonates with satisfactory APGAR scores.

CONCLUSION

The success rate of VD was 93.6%. Neonates delivered by CS had a higher rate of NICU admission and longer length of stay, prematurity induced morbidity and lower birth weight. There were no cases of intrapartum complications or intrapartum fetal deaths. To conclude, this study showed that VD is safe, especially when the leading twin is in vertex presentation. As such, women with a twin pregnancy > 32 weeks gestation should be counselled that a planned VD where the leading twin is in vertex presentation is safe and yields favourable perinatal outcomes.

REFERENCES

1. Fell DB, Joseph K. Temporal trends in the frequency of twins and higher-order multiple births in Canada and the United States. *BMC Pregnancy Childbirth* 2012; 12:103.
2. Steinman G. Mechanisms of twinning: VII. Effect of diet and heredity on the human twinning rate. *J Reprod Med* 2006; 51(5): 405–10.
3. Barrett J, Hannah M, Hutton E, et al. A randomized trial of planned Cesarean or vaginal delivery for twin pregnancy. *N Engl J Med* 2013; 369(14): 1295–1305.
4. Zamarfand MH, Goossens SM, Tajik P, et al. Planned Cesarean or planned vaginal delivery for twins: a secondary analysis of a randomized controlled trial. *Ultrasound Obstet Gynaecol* 2019; doi: 10.1002/uog.21907 Epub ahead of print.
5. Dong Y, Luo Z-C, Yang Z-J, et al. Is Cesarean delivery preferable in twin pregnancies at ≥ 36 Weeks gestation? *PLoS ONE* 2016; 11(5): e0155692.
6. Vuori E, Gissler M. Perinatal statistics: parturients, deliveries and newborns 2014. Helsinki, Finland: National Institute for Health and Welfare, 2015. Available from: <https://www.julkari.fi/handle/10024/12671>.
7. Hamilton BE, Martin JA, Osterman MJ, et al. Births: final data for 2014. *Natl Vital Stat Rep* 2015; 64: 1–6.
8. Lee YM. Delivery of twins. *Semin Perinatol.* 2012; 36: 195–200.
9. Vogel JP, Torloni MR, Seuc A et al. Maternal and perinatal outcomes of twin pregnancy in 23 low- and middle-income countries. *PLoS One* 2013; 8(8): 1–7.
10. Dera A, Breborowicz G, Keith L. Twin pregnancy-physiology, complications and mode of delivery. *Arch Perinat Med.* 2007; 13: 7–16.
11. Joseph KS, Marcoux S, Ohlsson A, et al. Changes in stillbirth and infant mortality associated with increases in preterm birth among twins. *Pediatrics* 2001; 98: 57–64.
12. Arnold C, McLean F, Kramer M, et al. Respiratory distress syndrome in second-born versus first-born twins. A matched case-control analysis. *N Engl J Med* 1987; 317: 1121–5.
13. Bibbo C, Robinson JN. Management of twins: vaginal or cesarean delivery? *Clin Obstet Gynecol* 2015; 52: 294–308.
14. Jhaveri RR, Nadkarni TK. Perinatal outcome of second twin with respect of mode of delivery: an observational study. *J Clin Diagnost Res* 2016; 10(12): QC26–QC28.
15. Lavender T, Justus Hofmeyr G, Neilson JP, et al. Cesarean Section for non-medical reasons at term. *Cochrane Database Syst Rev* 2012; 3: CD004660.
16. Souza JP, Gulmezoglu A, Lumbiganon P, et al. Cesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: the 2004-2008 WHO Global Survey on Maternal and Perinatal Health. *BMC Med* 2010; 8: 71.
17. Pallassmaa N, Ekblad U, Aitokallio-Tallberg A, et al. Cesarean delivery in Finland: maternal complications and obstetric risk factors. *Acta Obstet Gynecol Scand* 2010; 89: 869–902.
18. Reitter A, Daviss BA, Krimphove MJ, et al. Mode of birth in twins: data and reflections. *J Obstet Gynecol* 2018; 38 (4): 502–10.
19. Easter SR, Taouk ML, Schulkin J, et al. Twin vaginal delivery: innovate or abdicate. *Am J Obs Gynecol.* Elsevier Inc.; 2017;216(5):484–8.
20. Schmitz T, Prunet C, Azria E, et al. Association between planned

- caesarean delivery and neonatal mortality and morbidity in twin pregnancies. *Obstet Gynecol* 2017; 129(6): 986–55.
21. Rossi A, Mullin P, Chmait R. Neonatal outcomes of twins according to birth order, presentation and mode of delivery: A systematic review and meta-analysis. *BJOG* 2011; 118: 523–32.
 22. Rayburn F, Lavin P, Miodovnik W, et al. Multiple gestation: time interval between delivery of the first and second twins. *Obstet Gynecol* 1984; 63(4): 502–6.
 23. Ylilehto E, Palomaki O, Huhtala H, et al. Term twin birth – impact of mode of delivery on outcome. *Acta Scand Gynecol* 2017; 96: 589–596.
 24. Sadeh-Mestechkin D, Daykan Y, Bustan M, et al. Trial of vaginal delivery for twins – is it safe? A Single Center Experience. *J Matern Fetal Neonatal Med.* 2018; 31(15): 1967–71.
 25. Barzilay E, Morisaki N, Vogel JP, et al. Mode of delivery of twin gestation with very low birthweight: is vaginal delivery safe? *Am J Obstet Gynecol* 2015; 213(219): e1–8.
 26. Fox NS, Cohen N, Odom E, et al. Long-term outcome of twins based on the intended mode of delivery. *J Matern Fetal Neonatal Med* 2016; 16: 2164–9.
 27. Leung TY, Tam WH, Leung TN, et al. Effect of twin-to-twin delivery interval based on umbilical cord blood gas in the second twins. *BJOG* 2002; 109: 63–7.
 28. Benito M, De Bonrostro C, Agustin A, et al. Impact of intertwin interval on short-term neonatal outcomes of the second twin in dichorionic pregnancies with vaginal delivery. *Int J Gynecol Obstet* 2019; 145: 193–8.
 29. McGrail CD, Bryant DR. Intertwin time interval: how it affects the immediate neonatal outcome of the second twin. *Am J Obstet Gynecol* 2005; 192: 1420–22.

Неонатальные и материнские исходы при спонтанном многоплодовом зачатии беременности в зависимости от способа родов

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Резюме

Введение: Правильное поведение при рождении близнецов остается проблемой в акушерской практике. Целью данного исследования было сравнение неонатальных и материнских исходов при рождении близнецов в зависимости от способов родов.

Материалы и методы: Это одноцентровое ретроспективное когортное исследование всех последовательных спонтанно родившихся близнецов (≥ 24 недель, предполагаемый вес плода ≥ 500 грамм) в течение девятилетнего периода с 01.01.2007 по 31.12.2016 в медицинском центре третичного уровня. Неонатальные исходы включали выживаемость, результаты теста APGAR, патологию, связанную с преждевременными родами (ППР), поступление в отделение интенсивной терапии новорожденных (ОИТН) и длительность пребывания (ДП). Материнские исходы включали послеродовые осложнения и ДП. Статистический анализ состоял из критерия хи-квадрат с последующим значением p и отношения вероятностей с доверительным интервалом 95%. Статистическая значимость была установлена на уровне $p < 0.05$.

Результаты: В исследование было включено 173 женщины со спонтанным многоплодовым зачатием беременности, 129 (74.6%) родили с помощью кесарева сечения (КС). Частота успешных вагинальных родов (ВР) составила 93.6% (44/47). Была выявлена сильная статистически значимая корреляция между КС и поступлением в ОИТН: 53.2% против 1.5% ($p = 0.0001$). Неонатальная ДП в ОИТН был значительно дольше в группе КС. Патология, связанная с преждевременными родами (ППР), была обнаружена у 75 пар близнецов (75/173); 61 пара родилась с КС, что даёт сильную статистически значимую разницу ($p < 0.0001$). Послеродовые осложнения возникли в 14.7% случаев КС по сравнению с 13.6% случаев ВР.

Заключение: Новорожденные, рожденные с КС, имели более высокую частоту ППР, поступления в ОИТН, меньшую массу тела при рождении и более продолжительную ДП. Это исследование показало, что ВР безопасны, особенно когда первый близнец имеет головное предлежание.

Ключевые слова

кесарево сечение, когортное исследование, спонтанное зачатие, близнецы, вагинальные роды
