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Comparison of maternal and neonatal outcomes in twin pregnancies according to delivery types: vaginal delivery or Cesarean delivery?

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Abstract

Objective: Our aim was to compare the maternal and neonatal outcomes of twin pregnancies, which result in vaginal delivery (VD) and Cesarean section (CS), and the factors affecting the decision of CS.

Methods: Twin pregnancies between 30 and 39 weeks who gave birth in a tertiary center were included in the present study. The demographic data and maternal and neonatal outcomes of the patient groups who gave birth <32 weeks, 32–37 weeks, and >37 weeks were recorded and compared according to the type of birth.

Results: A total of 1209 patients were included in the study. The 1- and 5-minute Apgar scores of the 1st and 2nd fetuses in twin pregnancies <32 weeks of gestation were higher in the CS group at a statistically significant level (p=0.007, p=0.010, p=0.001, and p=0.003, respectively). The 1- and 5-minute Apgar scores of the 2nd fetuses of the pregnant women >37 weeks of age were higher in the VD group at a statistically significant level (p=0.039 and p=0.032, respectively). The newborn intensive care unit (NICU) admission rates of 1st fetus and 2nd fetus in the groups of <32 weeks, 32–37 weeks, and >37 weeks were higher in those born by CS at a statistically significant level when compared to those born by VD (1st fetus p<0.001, p<0.001, p=0.016, respectively; 2nd fetus p<0.001, p<0.001, p=0.012, respectively).

Conclusion: It must be kept in mind that twin pregnancies have high risks. However, vaginal delivery can be considered as a safe and reasonable option in appropriately selected cases and in the presence of experienced obstetricians by being careful about maternal and neonatal complications which might occur.

Keywords: Twin pregnancy, vaginal delivery, maternal morbidity, delivery type, perinatal morbidity.

Introduction

Twin pregnancies account for 3–3.5% of all pregnancies.[1] Significant increases were detected in recent years in the frequency of multiple pregnancies with the rise in advanced maternal age and the rise in pregnancies with assisted reproductive techniques (ART).[2] However, the effect of the delivery method in twin pregnancies on maternal and neonatal outcomes is still controversial. Although some studies reported that vaginal delivery (VD) might cause increased neonatal mortality and morbidity in the second fetus,[3,4] more recent studies and meta-analyses reported that VD does not negatively influence fetus outcome.[5–7] Also, based on evidence from new data, the American Congress of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine Associations also suggested that VD is appropriate if the first fetus is in cephalic

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presentation.[8] However, many obstetricians still prefer Cesarean section (CS) for deliveries in twin pregnancies due to the concerns on neonatal complications, including cord prolapse, abruptio placentae, and hypoxic damage in the second twin in VD.[9]

Twin pregnancies are classified at high risk because of higher maternal and perinatal morbidity rates when compared to singleton pregnancies.[10] One of the biggest reasons for this high risk is preterm birth.[11] However, twin babies with weights more than 2500 grams also have higher risks of mortality when compared to single babies with the same birth weight.[10] Neonatal convulsions, respiratory distress syndrome (RDS), and low Apgar scores at 1- and 5-minute were found to be increased more in twin newborns when compared to single newborns in the same gestational age.[10] However, recent studies showed that CS delivery in twin pregnancies does not reduce the risk of short- or long-term neonatal morbidity compared to VD.[7,12]

The data on the relation between the delivery type and maternal morbidity in twin pregnancies are limited. When compared with singleton pregnancies, twins have increased maternal rates for postpartum bleeding, postpartum hysterectomy, and a slightly increased risk of death.[9] Determining the optimal delivery type is critical in minimizing the risk of these adverse outcomes. A randomized controlled study conducted to compare twin pregnancies who gave birth by CS and VD in women who had twin pregnancies did not report any significant differences in maternal outcomes.[7] However, some authors argued that twin pregnancies with CS had increased risks of bleeding, infection, and longer hospitalization; and for this reason, VD was safer in twin pregnancies.[13,14]

The present study aimed to investigate the maternal and neonatal outcomes of twin pregnancies resulting in VD and CS.

Methods

Women with twin pregnancies between 30 and 39 weeks of gestation who gave birth at Kanuni Sultan Suleyman Training and Research Hospital, Turkey, between January 1, 2012 and February 01, 2018, were included in the present study. The study was approved by the Ethics Committee of our hospital (Ethics Committee decision number: 2021/10). Triplets or more multiple pregnancies, monochorionic-monoamniotic patients, those who had unknown chorionicity, twin-twin transfusion syndrome, twin pregnancies with combined VD-CS, fatal fetal anomaly, patients who had multiple pregnancies and previous fetal reduction, placenta previa and vasa previa were excluded from the study. Women with twin pregnancies whose data were fully available and who gave birth in our hospital were included in the study. These data were recorded retrospectively: age, parity, fetus presentation, week of gestation at delivery, chorionicity status, delivery type, and perinatal and maternal mortality and morbidity status of all patients. Maternal outcomes (i.e., preeclampsia, gestational diabetes mellitus, and preterm premature rupture of membranes [PPROM]) were recorded. Pregnancy complications (i.e., bladder damage, bowel damage, postpartum bleeding, endometritis, venous thromboembolism, hysterectomy, blood transfusion, and maternal death) were also recorded. Neonatal results were recorded as the birth weights of 1st and 2nd fetus, 1- and 5-minute APGAR scores of 1st and 2nd fetus, administration of betamethasone doses, presentations of 1st and 2nd fetus, admission of 1st and 2nd fetuses to the newborn intensive care unit (NICU), neonatal complications (RDS, sepsis), and co-twin complications (i.e., co-twin intrauterine fetal death [IUFD], co-twin intrauterine growth restriction [IUGR] and co-twin oligohydramnios). Patients who gave birth <32 weeks, 32–37 weeks, and >37 weeks were grouped separately, and the patients in each group were divided into two groups as those who gave birth by CS and VD. The demographic data, maternal outcomes, and fetal outcomes were compared between the three groups according to the mode of delivery. Statistical analysis of the study was made by using the IBM SPSS version 26.0 (IBM SPSS Inc.; Chicago, IL, USA) program. The distribution of data was evaluated by using the Kolmogorov-Smirnov test. In addition to the descriptive statistical methods (i.e., mean, standard deviation) that were used in the evaluation of normally distributed data, the independent t-test was also used in comparing the independent groups. If the distribution of the variables was not normal, the Mann-Whitney U-test was used. The Chi-square test or Fisher's exact test was used for the comparison of the categorical data. The results were evaluated at $p<0.05$ significance level.

Results

A total of 1390 multiple pregnant women gave birth in our hospital between January 1, 2012 and February 01, 2018. Among these, 107 patients whose records could not be reached or whose records were missing, 22 patients with triplets and more multiple pregnancies, 8 patients who gave birth by combined VD-CS, 32 patients with the fatal fetal anomaly, and 12 patients who had multiple pregnancies and fetal reduction were excluded, and a total of 1209 patients were included in the study.

The demographic data of the groups are listed in **Table 1**. Among the 1209 twin pregnancies, 113 (11.0%) gave birth <32 weeks, 616 (51.0%) at 32–37 weeks, and 460 (38.0%) above 37 weeks. The rates of giving birth by VD and CS in pregnancies <32 weeks were 17.3% and 82.7%, respectively, and 11.7% and 88.3% in pregnancies at 32–37 weeks, and 13.0% and 87.0% in pregnancies >37 weeks.

The comparison of neonatal results of the groups by delivery weeks are given in **Table 2**. In twin pregnancies <32 weeks, the 1- and 5-minute Apgar scores of the 1st and 2nd fetuses were significantly higher in the CS group, and the 1- and 5-minute Apgar scores of the 2nd fetuses >37 weeks were significantly higher in the VD group (p=0.007, p=0.010, p=0.001 and p=0.003, p=0.039 and p=0.032, respectively). No significant differences were detected between the 1- and 5-minute Apgar scores of pregnant women at 32–37 weeks. In terms of the presentation status, cephalic-cephalic presentation was most common in those who gave birth by VD in the group <32 weeks, and noncephalic presentation was most common in the CS group (39.1%, 49.0%, p=0.023, respectively). The most common cephalic-cephalic presentation was seen in both groups at 32–37 weeks (50.0%, 40.8%, p=<0.001, respectively). The most common cephalic-cephalic presentation >37 weeks was observed in the VD group, and the noncephalic presentation was most common in the CS group (48.3%, 38.5%, p<0.001, respectively). In terms of the neonatal complication rates, the NICU admission rates of 1st fetus and 2nd fetus in the groups <32 weeks, 32–37 weeks, and >37 weeks were higher at a statistically significant level in those born by CS compared to those born by VD (1st fetus p<0.001, p<0.001, p=0.016, respectively, and 2nd fetus p<0.001, p<0.001, p=0.012, respectively).

Although no significant differences were detected between CS and VD groups in the RDS and sepsis rates of first fetuses in the groups <32 weeks and >37 weeks (p=0.145, p=0.703, p=0.453, p=0.777, respectively), RDS and sepsis in the group 32–37 weeks were significantly higher in those who were born by CS (RDS and sepsis, p=0.145, p=0.703, respectively).

Although no significant differences were detected between CS and VD groups in the rates of RDS and sepsis in 2nd fetuses <32 weeks (p=0.059, p=0.457, respectively), both RDS and sepsis rates were significantly higher in those born by CS at 32 and 37 weeks (p< 0.001, p<0.001, respectively). In the 2nd fetuses >37 weeks of age, RDS rates were significantly higher in those born by CS (p=0.004), and no difference was detected between sepsis rates (p=0.304). The co-twin IUGR rates in the group <32 weeks and in the group >37 weeks were significantly higher in those born by CS in co-twin complications (p=0.007, p=0.030, respectively), and there was no difference in terms of CS and VD births in those born 32–37 weeks (p=0.083). There was no difference in the rates of twin oligohydramnios between the groups.

Maternal complications are listed in **Table 3**. The incidence of maternal complications was not significant between the groups.

Table 1. Demographic data of the groups.

	<32 weeks			32–37 weeks			>37 weeks		
	VD (n=23)	CS (n=110)	p-value	VD (n=72)	CS (n=544)	p-value	VD (n=60)	CS (n=400)	p-value
Age (mean±SD)	29.91±8.68	27.61±5.76	0.116*	26.68±7.02	27.77±5.58	0.133*	29.10±6.98	31.71±5.62	**0.001***
Pregnancy [median (min–max)]	2 (1–5)	1 (1–7)	0.839†	2 (1–9)	2 (1–7)	0.455†	2 (1–7)	2 (1–9)	0.616†
Parity [median (min–max)]	0 (0–3)	0 (0–5)	0.785†	1 (0–5)	1 (0–11)	0.251†	1 (0–5)	1 (0–8)	0.159†
Previous Cesarean section (n,%)	0 (0.0)	15 (13.6)	0.217‡	1 (1.4)	176 (32.4)	**<0.001‡**	2 (3.3)	159 (39.8)	**<0.001‡**

*Independent samples t test; †Mann-Whitney U test; ‡Chi-square test.

Table 2. Comparison of neonatal results of the groups by delivery week.

		<32 weeks			32–37 weeks			>37 weeks		
		VD (n=23)	CS (n=110)	p-value	VD (n=72)	CS (n=544)	p-value	VD (n=60)	CS (n=400)	p-value
Birthweight	1st fetus	1556.74±356.82	1486.49±400.71	0.438*	2294.31±501.22	2272.53±784.98	0.819*	2270.82±719.16	2247.78±644.76	0.800*
	2nd fetus	1383.17±510.86	1337.12±492.05	0.686*	2237.92±512.79	2218.78±474.31	0.750*	2117.08±748.71	2180.53±648.54	0.489*
1st fetus Apgar score	1-minute	3.39±3.46	5.15±2.61	**0.007***	8.03±1.72	7.87±1.47	0.392*	7.55±2.49	7.98±1.58	0.197*
	5-minute	4.43±4.18	6.35±2.93	**0.010***	9.15±1.80	8.87±1.47	0.142*	8.70±2.67	8.91±1.56	0.387*
2nd fetus Apgar score	1-minute	2.48±3.13	5.19±2.35	**0.001***	7.61±2.21	7.67±1.65	0.795*	7.82±1.93	6.93±3.15	**0.039***
	5-minute	3.39±4.04	6.33±2.64	**0.003***	8.69±2.36	8.72±1.62	0.911*	8.76±2.04	8.08±3.31	**0.032***
Betamethasone administration		9 (39.1)	81 (73.6)	**0.001†**	7 (9.7)	103 (18.9)	0.055†	15 (25.4)	119 (29.8)	0.495†
Chorionicity	MKDA	14 (60.9)	32 (29.1)	**0.004†**	17 (23.6)	158 (29.0)	0.337†	7 (11.7)	70 (17.5)	0.259†
	DKDA	9 (39.1)	78 (70.9)		55 (76.4)	386 (71.0)		53 (88.3)	330 (82.5)	
Presentation (1st fetus - 2nd fetus)	Cephalic- cephalic	9 (39.1)	45 (40.9)	**0.023†**	36 (50.0)	222 (40.8)	**<0.001†**	29 (48.3)	125 (31.25)	**<0.001†**
	Cephalic- noncephalic	7 (30.4)	11 (10.0)		21 (29.1)	112 (20.5)		14 (23.3)	121 (30.2)	
	Noncephalic	7 (30.4)	54 (49.0)		15 (20.8)	210 (38.6)		17 (28.3)	154 (38.5)	
NICU admission	1st fetus	9 (39.1)	92 (83.6)	**<0.001†**	9 (12.5)	223 (41.0)	**<0.001†**	14 (23.2)	158 (39.5)	**0.016†**
	2nd fetus	7 (30.4)	93 (84.5)	**<0.001†**	8 (11.1)	251 (46.1)	**<0.001†**	14 (23.3)	119 (29.8)	**0.012†**
1st fetus neonatal complication	RDS	4 (17.4)	36 (32.7)	0.145†	6 (8.3)	173 (31.8)	**<0.001†**	6 (10.0)	54 (13.5)	0.453†
	Sepsis	4 (17.4)	23 (20.9)	0.703†	3 (4.2)	114 (21.0)	**<0.001†**	10 (16.7)	61 (15.3)	0.777†
2nd fetus neonatal complication	RDS	3 (13.0)	36 (32.7)	0.059†	5 (6.9)	200 (36.7)	**<0.001†**	8 (13.3)	126 (31.5)	**0.004†**
	Sepsis	1 (4.3)	2 (1.8)	0.457†	3 (4.2)	27 (5)	**0.001†**	1 (1.7)	18 (4.5)	0.304†
Co-twin complications	Co-twin IUGR	5 (21.7)	58 (52.7)	**0.007†**	3 (4.2)	58 (10.7)	0.083†	8 (13.3)	105 (26.3)	**0.030†**
	Co-twin Oligohydramnios	3 (13.0)	9 (8.2)	0.459†	0 (0.0)	17 (3.1)	0.128†	0 (0.0)	2 (0.5)	0.583†
	Co-twin IUFD	5 (21.7)	5 (4.5)	**0.004†**	0 (0.0)	36 (6.6)	**0.024†**	1 (1.7)	2 (0.5)	0.295†

*Independent samples t test; †Chi-square test. p<0.05: statistically significant. **IUFD:** intrauterine fetal death; **IUGR:** intrauterine growth restriction; **NICU:** newborn intensive care unit; **RDS:** respiratory distress syndrome.

Table 3. Comparison of maternal results of the groups by delivery week.

	<32 weeks			32–37 weeks			>37 weeks		
	VD (n=23)	CS (n=110)	p-value	VD (n=72)	CS (n=544)	p-value	VD (n=60)	CS (n=400)	p-value
Preeclampsia	2 (8.7)	6 (5.5)	0.626*	7 (9.7)	51 (9.4)	0.924*	2 (3.3)	9 (2.3)	0.643*
GDM	0 (0.0)	3 (2.7)	1.000*	8 (11.1)	28 (5.1)	0.143*	5 (8.3)	16 (4.0)	**0.003***
PPROM	5 (21.7)	26 (23.6)	1.000*	4 (5.6)	56 (10.3)	0.289*	8 (13.3)	41 (10.3)	0.470†
Bladder injury	0 (0.0)	0 (0.0)	-	0 (0.0)	2 (0.4)	1.000*	0 (0.0)	0 (0.0)	-
Atonia	0 (0.0)	1 (0.9)	1.000*	1 (1.4)	5 (0.9)	0.527*	0 (0.0)	9 (2.3)	0.613*
Intestinal injury	0 (0.0)	0 (0.0)	-	0 (0.0)	0 (0.0)	-	0 (0.0)	3 (0.8)	1.000*
Venous thromboembolism	0 (0.0)	1 (0.9)	1.000*	0 (0.0)	1 (0.2)	1.000*	0 (0.0)	4 (1.0)	1.000*
Hysterectomy	1 (4.3)	1 (0.9)	0.317*	0 (0.0)	2 (0.4)	1.000*	0 (0.0)	3 (0.8)	1.000*
Blood transfusion	1 (4.3)	0 (0.0)	0.173*	0 (0.0)	1 (0.2)	1.000*	1 (1.7)	4 (1.0)	0.504*
Maternal death	0 (0.0)	0 (0.0)	-	0 (0.0)	0 (0.0)	-	0 (0.0)	0 (0.0)	-

*Fisher's exact test; †Chi-square test. p<0.05: statistically significant. **GDM:** gestational diabetes mellitus; **PPROM:** premature rupture of membranes.

Discussion

In the present study, we investigated maternal and neonatal outcomes of twin pregnancies that resulted in VD and CS. A total of 155 (12.8%) of 1209 patients gave birth by VD and 1054 (87.1%) by CS (CS rate 87.1%). The rates of giving birth by VD and CS in pregnancies <32 weeks were 17.3% and 82.7%, respectively, 11.7% and 88.3% in pregnancies at 32–37 weeks, and 13.0% and 87.0% in pregnancies >37 weeks. The 1- and 5-minute Apgar scores of the 1st and 2nd fetuses in twin pregnancies <32 weeks were statistically and significantly higher in the CS group, and 1- and 5-minute Apgar scores of 2nd fetuses in pregnant women >37 weeks of age were statistically and significantly higher than in the VD group. The presentations of those who gave birth <32 weeks, at 32–37 weeks, and >37 weeks were significantly different. The NICU admission rates of 1st fetus and 2nd fetus in the groups <32 weeks, 32 and 37 weeks, and >37 weeks were statistically and significantly higher in those born by CS compared to those born by VD. RDS and sepsis rates were significantly higher in the 1st and 2nd fetuses born by CS at 32–37 weeks. The incidence of maternal complications was not significant between the groups.

Using the Robson's Ten Group Classification System, Hehir et al. reported that the Cesarean delivery rates for multiple pregnancies have steadily increased to >70% in recent years.[15] In our study, the rate of patients who gave birth by CS was 87.1%. CS rate in our study was above the rates in the literature. The reason for this difference may be that patients and doctors prefer CS delivery because they are afraid of risks. Another reason may be the insufficient experience of the physician or the different approaches of our hospital policy over the years during the study.

Many of the previous studies that examined the safest delivery type for twins were retrospective studies, and their results differed from each other. Although some of these studies argued that CS was more beneficial in twin pregnancies, some other studies argued that there were no differences between CS delivery and VD delivery.[16,17] In a multicenter and prospective study that was conducted in 25 countries and in 106 centers[6] and included 2804 twin pregnancies between 32 weeks and 38 weeks in 2003–2011, the delivery methods in twin pregnancies were discussed, and it was reported that VD did not increase negative maternal and neonatal outcomes for both fetuses. Also, no neurodevelopmental differences were reported between the groups in the follow-ups of twins until the age of 2.[18] As a result of this study, the authors reported that CS delivery was not associated with any known improvements in neonatal morbidity or mortality in pregnant women who had twin pregnancies more significant than 32 weeks and when the first fetus had a cephalic presentation.[6] Unlike this study, Smith et al. reported that CS delivery could reduce the risk of perinatal death of twins at term at a rate of 75% and that the reason for this was that CS delivery reduced the risk of mortality because of intrapartum anoxia in second twin.[19] The authors of a retrospective birth cohort study

that included more than 180,000 twin pregnancies reported that VD had better neonatal outcomes in twins between 32 and 34 weeks of gestation, there were no differences in delivery types between 35 and 36 weeks of gestation, and CS delivery was safer at 37 weeks of gestation.[20]

The results of the JUMODA study, which was a prospective cohort study published recently in France, showed that neonatal mortality and morbidity were lower in VD in the cephalic presentation of the first twin after 32 weeks of gestation.[1] As a result of this study, it was also reported that planned VD was appropriate instead of CS between 32 and 37 weeks of gestation and that their study was in line with the recommendations of ACOG.[2] Finally, it was shown in a study that evaluated 495 term twins according to delivery types that VD slightly increases the risk of low Apgar scores and low umbilical blood pH in second twin; however, when compared to CS, it did not increase the risk of serious neonatal morbidity.[21] In our study, the rates of NICU admission and neonatal complications of the 1st and 2nd fetuses in CS group were higher. Also, when we examined the 1- and 5-minute Apgar scores, we found them higher in the 1st and 2nd fetuses born <32 weeks in the CS group, but higher in the VD group in the 2nd fetuses born >37 weeks. The classification of neonatal outcomes according to weeks of gestation and the lack of difference in birth weights between groups suggest that these results are reliable. The fact that there was no difference in Apgar scores of those born by CS and VD in both fetuses at 32–37 weeks indicates that it is compatible with the recommendations of ACOG. Also, the first fetus was in cephalic position in 69.5% of those born by VD <32 weeks (39.1% cephalic-cephalic, 30.4% cephalic-noncephalic) and 79.1% (50% cephalic-cephalic, 29.1% cephalic-noncephalic) of those born at 32–37 weeks and 71.6% of those born >37 weeks (48.3% cephalic-cephalic, 23.3% cephalic-noncephalic) in the study. It was also found in our study that the 5-minute Apgar scores of 1st twins were significantly higher in CS group. According to the secondary results of the WHO Multicountry Survey on Maternal and Newborn Health (WHOMCS) study that included 29 countries, the rate of lower 5-minute Apgar score in twin pregnancies (for the first or second twins) was reported to be three times higher than in singleton pregnancies, and when both twins were compared, it was found that the second twin had a 1.3 times lower 5-minute Apgar score.[22] It was also reported that this significantly lower Apgar score for the second twin was always taken into consideration in the discussions on the best delivery type for twin pregnancies and on the time interval between the first and second twins; however, this was not an indication for CS.[22]

The prevalence of fetal death in one of the twins varied between 0.5% and 6.8%, and the worst results were in monochorionic twins. As a result, the surviving fetus is at a high risk of neurological morbidity and preterm delivery that includes fetal mortality at a rate of 50–70%.[23] Detailed analysis of chorionicity was not made in our study; however, when the co-twin complications were evaluated <32 weeks and >37 weeks, co-twin IUGR was significantly higher in CS. It was reported in the WHOMCS study that perinatal death was up to four times higher in twin pregnancies than in singleton pregnancies because of preterm birth, IUGR, low Apgar scores, and extremely low birth weight; and that perinatal death was 2.5 times more in the first twin and 3.5 times more in the second twin.[22]

The data on maternal morbidity according to delivery type in twin pregnancies are limited. In the WHO Global Survey Analysis Study (2004–2008), it was reported that twin pregnancies involve a significant and independent risk factor for maternal and perinatal morbidity and mortality compared to singleton pregnancies.[24] The same study also reported that the risk of severe maternal mortality and morbidity (i.e., maternal death, admission to ICU, blood transfusion, or hysterectomy) was 1.85 times higher in twin pregnancies when compared to singleton pregnancies.[24] No differences were reported in the maternal outcomes of the groups giving birth by CS and VD in a randomized and controlled study in which maternal results of twin pregnancies were evaluated according to delivery types.[6] However, it was reported in a more recent retrospective study conducted by Easter et al. that maternal morbidity and bleeding risks were higher in VD group than in CS group.[25] In the same study, maternal mortality, postpartum bleeding, infection, major procedure, infection or relaparotomy, need for dilatation and evacuation, venous thromboembolism, ileus, and ICU needs were included in maternal morbidity. A total of 788 twin pregnancies between 2005 and 2018 were included in a recent study that was conducted by Zafman et al., and no differences were reported between delivery types and maternal mor-

tality and morbidity.[9] There were rare serious maternal complications in the same study such as thrombosis, hysterectomy, bowel or bladder injury, and admission to ICU, and there were no differences between the groups.[9] Also, there were no significant differences between 3rd and 4th-degree laceration, endometritis, wound complications, and blood transfusion rates.[9] In our study, the complications such as thrombosis, endometritis, hysterectomy, bowel or bladder injury, and blood transfusions were rare in the groups, and we found no differences between the groups in this respect. Except that postpartum hemorrhage was increased in the CS group in the study of Easter et al., our results were consistent with the results of the studies of Zafman et al. and Eastern et al. Although the rates of wound infection and endometritis were similar between the groups, longer hospitalization also increased the risk of hospital-transmitted infection.[26] Here, it is worth stating that this increases the cost of hospitalization, causing burdens on the healthcare system.

There were some limitations in this study. Firstly, our study was planned retrospectively; and therefore, some data were difficult to access. However, despite the retrospective design, we believe that the validity of the data and the identified factors are accurate because all clinical and hospital medical records were available for review. Also, the presence of women who had previous VD in VD group might have affected the success in VD group. However, the fact that those who gave birth <32 weeks, at 32–37 weeks, and >37 weeks were analyzed separately ensured that the neonatal results were reliable. However, we excluded the complications related to monochorionicity in monochorionic twins, those with unknown chorionicity and monoamniotic twins, and tried to avoid other conflicting results in order not to cast doubt on these results. Also, we followed up the delivery processes of all pregnant women included in our study in the same clinic. There were few differences in pregnancy and delivery management, and all of the specialist physicians had experience in the delivery of twin pregnancies. In addition, the high number of patients, our clinic being a large tertiary center, the large variety of patients, and the fact that our study provided new and important data on maternal morbidity are the strengths of our study, especially when it is considered that the available data on maternal outcomes are limited. We believe that our study will contribute to the literature in terms of clinical practice, determining risk factors, and implementing protocols for maternal and perinatal care.

Conclusion

In conclusion, we found in our study that, in twin pregnancies, maternal complications were not affected by delivery type. The first fetus was in cephalic presentation in most of the twins in the VD group. Although the NICU admission was higher in the CS groups at all weeks, Apgar scores were higher in the CS group under 32 weeks. The Apgar scores of the second fetus over 37 weeks were better in the VD group. Our results can help obstetricians inform the women who have twin pregnancies and make management decisions for childbirth. However, it must be kept in mind that twin pregnancies also have high risks. However, vaginal delivery can be considered as a safe and reasonable option in appropriately selected cases and in the presence of experienced obstetricians by being careful about maternal and neonatal complications which might occur.

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References

1. Schmitz T, Prunet C, Azria E, BohecC, Bongain C, Chabanier P, et al. Association between planned cesarean delivery and neonatal mortality and morbidity in twin pregnancies. Obstet Gynecol 2017;129:986–95. [PubMed] [CrossRef]
2. Practice bulletin No. 169 Summary: multifetal gestations: twin, triplet, and higher-order multifetal pregnancies. Obstet Gynecol 2016;128:926–28. [PubMed] [CrossRef]
3. Smith GCS, Fleming KM, White IR. Birth order of twins and risk of perinatal death related to delivery in England, Northern Ireland, and Wales, 1994–2003: Retrospective cohort study. BMJ 2007;334:576–78. [PubMed] [CrossRef]
4. Roberts CL, Algert CS, Nippita TA, Bowen JR, Shand AW. Association of prelabor cesarean delivery with reduced mortality in twins born near term. Obstet Gynecol 2015;125:103–10. [PubMed] [CrossRef]
5. Schmitz T, Carnavalet C de C, Azria E, Lopez E, Cabrol D, Goffinet F. Neonatal outcomes of twin pregnancy according to the planned mode of delivery. Obstet Gynecol 2008;111:695–703. [PubMed] [CrossRef]

6. Barrett JFR, Hannah ME, Hutton EK, Willan AR, Allen AC, Armson BA, et al.; Twin Birth Study Collaborative Group. A randomized trial of planned cesarean or vaginal delivery for twin pregnancy. N Engl J Med 2013;369:1295–1305. [PubMed] [CrossRef]
7. Goossens SM, Ensing S, van der Hoeven MAHBM, Roumen FJME, Nijhuis JG, Mol BW. Comparison of planned caesarean delivery and planned vaginal delivery in women with a twin pregnancy: a nation wide cohort study. Eur J Obstet Gynecol Reprod Biol 2018;221:97–104. [PubMed] [CrossRef]
8. American College of Obstetricians and Gynecologists (College); Society for Maternal-Fetal Medicine; Caughey AB, Cahill AG, Guise JM, Rouse DJ. Safe prevention of the primary cesarean delivery. Obstet Gynecol Surv 2014;69:381–3. [PubMed] [CrossRef]
9. Zafman KB, Naqvi M, Melka S, Miller J, Rebarber A, Fox NS. The association between ıntended mode of delivery and maternal morbidity in twin pregnancies. Am J Perinatol 2019;36: 695–700. [PubMed] [CrossRef]
10. Hofmeyr GJ, Barrett JF, Crowther CA. Planned caesarean section for women with a twin pregnancy. Cochrane Database Syst Rev 2015;2015(12):CD006553. [PubMed] [CrossRef]
11. Joseph KS, Allen AC, Dodds L, Vincer MJ, Armson BA. Causes and consequences of recent ıncreases in preterm birth among twins. Obstet Gynecol 2001;98:57–64. [PubMed] [CrossRef]
12. Fox NS, Cohen N, Odom E, Gupta S, Lam-Rachlin JL, Satzman DH, et al. Long-term outcomes of twins based on the intended mode of delivery. J Matern Neonatal Med 2018;31: 2164–9. [PubMed] [CrossRef]
13. Blanchette H. The rising cesarean delivery rate in America: what are the consequences? Obstet Gynecol 2011;118:687–90. [PubMed] [CrossRef]
14. Lee HC, Gould JB, Boscardin WJ, El-Sayed YY, Blumenfled YJ. Trends in cesarean delivery for twin births in the united states: 1995–2008. Obstet Gynecol 2011;118:1095–101. [PubMed] [CrossRef]
15. Hehir MP, Ananth C V., Siddiq Z, Flood K, Friedman AM, D'Alton ME. Cesarean delivery in the United States 2005 through 2014: a population-based analysis using the Robson 10-Group Classification System. Am J Obstet Gynecol 2018;219:105.e1-105.e11. [PubMed] [CrossRef]
16. Fox NS, Silverstein M, Bender S, Klauser CK, Saltzman DH, Rebarber A. Active second-stage management in twin pregnancies undergoing planned vaginal delivery in a U.S. population. Obstet Gynecol 2010;115:229–33. [PubMed] [CrossRef]
17. Armson BA, O'Connell C, Persad V, Joseph KS, Joung DS, Baskett TF. Determinants of perinatal mortality and serious neonatal morbidity in the second twin. Obstet Gynecol 2006; 108:556–64. [PubMed] [CrossRef]
18. Asztalos E V., Hannah ME, Hutton EK, Willan AR, Allen AC, Armson BA, et al. Twin birth study: 2-year neurodevelopmental follow-up of the randomized trial of planned cesarean or planned vaginal delivery for twin pregnancy. Obstet Anesth Dig 2016;214:371.e1–e19. [PubMed] [CrossRef]
19. Smith GCS, Shah I, White IR, Pell JP, Dobbie R. Mode of delivery and the risk of delivery-related perinatal death among twins at term: a retrospective cohort study of 8073 births. BJOG 2005;112:1139–44. [PubMed] [CrossRef]
20. Dong Y, Luo ZC, Yang Z, Chen L, Guo YN, Branch W, et al. Is cesarean delivery preferable in twin pregnancies at ≥36 weeks gestation? PLoS One 2016;11:e0155692. [PubMed] [CrossRef]
21. Ylilehto E, Palomäki O, Huhtala H, Uotila J. Term twin birth – impact of mode of delivery on outcome. Acta Obstet Gynecol Scand 2017;96:589–96. [PubMed] [CrossRef]
22. Santana DS, Silveira C, Costa ML, Souza RT, Surita FG, Souza JP, et al.; WHO Multi-Country Survey on Maternal and Newborn Health Research Network. Perinatal outcomes in twin pregnancies complicated by maternal morbidity: evidence from the WHO Multicountry Survey on Maternal and Newborn Health. BMC Pregnancy Childbirth 2018;18:449. [PubMed] [CrossRef]
23. Vale-Fernandes E, Dias J, Gil B, Cadilhe A. Single fetal death in monochorionic twin pregnancy: co-twin prognosis and neonatal outcome. Acta Med Port 2017;30:148–51. [PubMed] [CrossRef]
24. Vogel JP, Torloni MR, Seuc A, Betran AP, Widmer M, Souza JP, et al. Maternal and perinatal outcomes of twin pregnancy in 23 low- and middle-income countries. PLoS One 2013;8: e70549. [PubMed] [CrossRef]
25. Easter SR, Robinson JN, Lieberman E, Carusi D. Association of intended route of delivery and maternal morbidity in twin pregnancy. Obstet Gynecol 2017;129:305–10. [PubMed] [CrossRef]
26. Malkin JD, Keeler E, Broder MS, Garber S. Postpartum length of stay and newborn health: a cost-effectiveness analysis. Pediatrics 2003;111:e316–21. [PubMed] [CrossRef]