

Active Second-Stage Management in Twin Pregnancies Undergoing Planned Vaginal Delivery in a U.S. Population

Nathan S. Fox, MD, Michael Silverstein, MD, Samuel Bender, MD, Chad K. Klauser, MD, Daniel H. Saltzman, MD, and Andrei Rebarber, MD

OBJECTIVE: To estimate neonatal morbidity and delivery outcomes according to planned mode of delivery in twin pregnancies with active second-stage management.

METHODS: This was an historic cohort of twin pregnancies delivered in one practice between June 2005 and September 2009 using a strict protocol of second-stage management, including breech extraction of a second noncephalic twin and internal version of a nonengaged cephalic second twin followed by breech extraction. Primary outcome was a 5-minute Apgar score less than 7 for twin B. Secondary outcomes were 5-minute Apgar score less than 7 for twin A and 1-minute Apgar score less than 7 and arterial cord pH below 7.20 for each twin.

RESULTS: A total of 287 twin pregnancies were included. There were 157 patients (54.7%) in the planned cesarean group and 130 patients (45.3%) in the planned vaginal delivery group. There was no significant difference in the rates of twin B having a 5-minute Apgar score lower than 7 or an arterial cord pH below 7.20. Among the patients in the planned vaginal delivery group, the cesarean delivery rate was 15.4%. No patients had a vaginal delivery of twin A followed by cesarean delivery of twin B. Among the patients in the planned vaginal delivery group, patients who had a successful vaginal delivery were more likely to be younger (31.56 ± 6.6 compared with 36.88 ± 6.1 years, $P = .001$) and were more likely to have a prior vaginal delivery (47.3% compared with 15.0%, $P = .007$).

CONCLUSION: Planned vaginal delivery of twin pregnancies seems to be associated with neonatal outcomes similar to those with planned cesarean delivery. Active second-stage management is associated with good neonatal outcomes and a low risk of combined vaginal–cesarean delivery.

LEVEL OF EVIDENCE: II

(*Obstet Gynecol* 2010;115:229–33)

The number and rate of twin births continue to increase, from 2.2% of all U.S. live births in 1990 to 3.2% of all live births in 2005.¹ The optimal route of delivery of twins has not yet been established because there is limited level I evidence. One small randomized trial has been published,² and another is underway.³ In a recently published retrospective study of patients in France, planned vaginal delivery was associated with neonatal outcomes similar to those with planned cesarean delivery.⁴ Additionally, in that study, active management of the second stage of labor in twin pregnancies, which included breech extraction of a second nonvertex twin as well as internal version of a second cephalic unengaged twin, was associated with a very low (0.5%) rate of combined vaginal–cesarean delivery and low composite morbidity of the second twin. However, in a recent review of the intrapartum management of twin pregnancies, it was posited that “internal version . . . is also absolutely contraindicated because it is potentially dangerous and because no one trained after about 1970 has any idea how to perform the maneuver.”⁵ In the absence of internal version and breech extraction, the risk of combined vaginal–cesarean delivery can be as high as 6–10%.^{6,7} For many patients, this risk may outweigh the small risk of neonatal injury during an internal version or breech extraction.

In our practice, we routinely offer women with twin pregnancies without contraindications to labor the op-

See related editorial on page 221.

From Maternal Fetal Medicine Associates, PLLC, and the Department of Obstetrics, Gynecology, and Reproductive Science, Mount Sinai School of Medicine, New York, New York.

Corresponding author: Nathan S. Fox, MD, Maternal Fetal Medicine Associates, PLLC, 70 East 90th Street, New York, NY 10128; e-mail: nfox@mfnynyc.com.

Financial Disclosure

The authors did not report any potential conflicts of interest.

© 2010 by The American College of Obstetricians and Gynecologists. Published by Lippincott Williams & Wilkins.

ISSN: 0029-7844/10



tion of labor and active management of the second stage, including internal version and breech extraction if necessary. The purpose of this study was to report outcomes of second-stage active management of twin pregnancies in a contemporary U.S. high-volume practice and to compare outcomes of twin pregnancies with attempted labor and active second-stage management with twin pregnancies with planned cesarean delivery.

METHODS

A study of twin pregnancies delivered in one practice between June 2005 and August 2009 was conducted. All patients were delivered in a tertiary-care academic medical center with a level III neonatal intensive care nursery and 24-hour in-house pediatric and obstetric anesthesia availability. All patients' labors were managed, and deliveries were performed by one of the six attending obstetricians in our practice. House staff were involved in many deliveries, but never as the primary operator. Monoamniotic pregnancies were excluded from analysis. Institutional review board approval was obtained from the Biomedical Research Alliance of New York before reviewing any medical records.

All twin pregnancies received their prenatal care in our practice. Gestational age and chorionicity was confirmed by first-trimester ultrasonography in all cases. All twin pregnancies in our practice routinely have second-trimester ultrasonography to examine for anomalies and monthly ultrasonography estimating fetal growth, or more frequently if fetal growth restriction is suspected. Weekly biophysical profile testing is routinely performed starting at 32–34 weeks, or earlier or more frequently as indicated. We deliver all twin pregnancies at 38 weeks of gestation, or earlier if indicated. We routinely counsel our patients with twin pregnancies regarding mode of delivery. For those where vaginal delivery is not contraindicated, we discuss in detail the process, the risk of cesarean delivery in labor, and the risk of birth injury. Contraindications to vaginal twin delivery of twins in our practice are nonvertex presenting twin, nonvertex second twin with an estimated fetal weight more than 20% larger than the presenting twin, nonvertex second twin with an estimated fetal weight less than 1,500 g, and other usual contraindications to labor (placenta previa, prior classical cesarean delivery, and others). After discussing the risks and benefits of vaginal delivery, the patient informs us whether she would like to attempt a vaginal delivery. All patients have the option to elect a cesarean delivery, regardless of the position of the second twin. We do not attempt to dissuade a patient from choosing an elective cesarean delivery.

We defined the planned vaginal delivery group as all patients for whom a vaginal twin delivery was intended. The planned cesarean group included patients with a contraindication to vaginal twin delivery, as well as those patients who elected to have a cesarean delivery.

For patients planning a cesarean delivery, we perform them at 38 completed weeks of gestation, or earlier if indicated or in spontaneous labor, and after amniocentesis documenting fetal lung maturity, if indicated. Unless contraindicated, all patients undergoing cesarean delivery have regional anesthesia.

Planned vaginal twin births are managed according to a strict protocol. All patients are admitted to the labor unit and receive an 18-gauge intravenous line with lactated Ringer's solution, typically at 125 mL/h. Epidural anesthesia is administered by one of the anesthesiologists. For patients who desire full sensation during labor, an epidural catheter is placed and tested and left in place until the time of delivery. Patients with twin pregnancies in active labor are always under our direct care onsite. All patients have continuous fetal heart rate monitoring for both twins and one-to-one or one-to-two nursing supervision. Oxytocin and amniotomy are used for standard indications. Cesarean delivery in labor is performed for the usual obstetric indications. When the cervix is fully dilated and the presenting fetus is at approximately +2/5 station, the patient is moved to the operating room for delivery. All twin deliveries occur in the operating room with one or two obstetricians, an anesthesiologist, two pediatric teams, two nurses, and a scrub nurse present. A sterile cesarean delivery set is opened and available for use in an emergency. Continuous fetal heart rate monitoring of both twins is maintained during the second stage of labor, and ultrasonography is used for assistance as necessary. An additional epidural bolus is given for pain relief before delivery in case breech extraction is necessary.

Operative delivery of twin A is performed for the usual indications. We do not routinely perform episiotomies, although we will perform them if deemed clinically appropriate. After delivery of twin A, the cord is clamped and cut and the presentation of twin B is ascertained by physical examination, sometimes with the assistance of ultrasonography. If twin B is vertex and engaged, the patient is instructed to push and amniotomy is performed. Oxytocin is used as appropriate. Operative delivery of twin B is performed for the usual indications. If breech extraction of twin B is expected and the patient had been receiving oxytocin, it is discontinued. If twin B is breech or transverse, complete breech extraction is



performed using standard obstetric maneuvers.⁵ If twin B is cephalic and unengaged, internal version is performed in the following manner: one hand of the operator is placed in the uterus, membranes intact, and palpates along the fetal spine toward the breech and legs. If membranes rupture, the maneuver is continued. The operator's other hand palpates along the maternal abdomen. Using the internal and external hand, the fetus is rotated to breech presentation and both feet are brought into the vagina with the fetal spine up. If membranes did not rupture already, amniotomy is performed, followed by breech extraction. Piper forceps are not used routinely but are available if deemed necessary.

The two most senior obstetricians in our practice formally trained in internal version during their residencies. The other obstetricians in our practice were trained by these obstetricians.

Each twin is attended by a pediatrician after delivery, and Apgar scores are assigned by the pediatric team. Arterial and venous cord blood gas values are ascertained in the event of a low Apgar score or other clinical concern for fetal acidemia.

Our primary outcome was a 5-minute Apgar score less than 7 for twin B. Secondary outcomes were 5-minute Apgar score less than 7 for twin A and 1-minute Apgar score less than 7 and arterial cord pH less than 7.20 for each twin. The χ^2 , Fisher exact test, and Student *t* test were used when appropriate (SPSS for Windows 16.0, SPSS Inc., Chicago, IL).

RESULTS

A total of 287 twin deliveries were included. The overall cesarean rate for our cohort was 61.3%. There were 157 patients (54.7%) in the planned cesarean group and 130 patients (45.3%) in the planned vaginal delivery group. The planned cesarean group on average was older and had fewer patients with a prior vaginal delivery; there was no difference in chorionicity between the groups (Table 1). The planned cesarean delivery group delivered at earlier gestational ages and therefore had smaller mean birth weights (Table 2). In the entire cohort, there were low rates of 5-minute Apgar scores less than 7 and arterial cord pH values less than 7.20. These outcomes were not significantly different between the planned cesarean group and the planned vaginal delivery group (Table 2).

We looked at outcomes in the 130 patients in the planned vaginal delivery group. Only 20 patients (15.4%) underwent a cesarean delivery in labor, and 110 patients (84.6%) had a vaginal delivery of both twins. Indications for cesarean delivery in the planned vaginal group were arrest of labor (16 patients), arrest in the

Table 1. Baseline Characteristics

	Planned Cesarean Delivery (n=157)	Planned Vaginal Delivery (n=130)	<i>P</i>
Maternal age (y)	35.56±6.6	32.38±6.8	<.001
Prior vaginal delivery	37 (23.6)	55 (42.3)	.001
Prior cesarean delivery	24 (15.3)	6 (4.6)	.003
Dichorionic	137 (87.3)	115 (88.5)	.757

Data are mean±standard deviation or n (%) unless otherwise specified.

second stage (two patients), and nonreassuring fetal status (two patients). There were no patients who had a vaginal delivery for twin A followed by a cesarean delivery for twin B. Thirteen of the 110 patients (11.8%) who delivered vaginally had an operative delivery of twin A, and 7 of the 110 patients (6.4%) had an operative delivery of twin B. Breech extraction of twin B was performed in 77 of the 110 patients (70%). There was only one birth injury noted during breech extraction, which was a fractured humerus during reduction of a nuchal arm. According to the parents, this child had no permanent injury as of 18 months of life.

In the planned vaginal delivery group, the patients who had a successful vaginal delivery were more likely to be younger (31.56±6.6 compared with 36.88±6.1 years, *P*=.001) and were more likely to have a prior vaginal delivery (47.3% compared with 15.0%, *P*=.007). Overall, the rate of adverse neonatal outcomes was very low in the planned vaginal delivery group and did not differ significantly based on mode of delivery (Table 3).

DISCUSSION

In this study of twin pregnancies, planned vaginal delivery was not associated with outcomes significantly different from those with planned cesarean delivery. This is consistent with other larger series that demonstrated similar morbidity and mortality in twin pregnancies delivered vaginally or via cesarean delivery.⁸ Additionally, among women who planned vaginal delivery, there was only a 15.4% cesarean delivery rate, and no patients had a vaginal delivery of twin A followed by a cesarean delivery of twin B. These results are encouraging when counseling women with twin pregnancies who desire a vaginal delivery. Our high vaginal delivery rates are likely due to two factors: patient selection and active management of the second stage of labor. Patient selection is critical to attempted vaginal delivery. In 2003, the rate of cesar-



Table 2. Outcomes Based on Planned Mode of Delivery

	Planned Cesarean Delivery (n=157)	Planned Vaginal Delivery (n=130)	P
Gestational age at delivery	35.18±3.0	36.70±1.2	<.001
Birth weight twin A	2,305.9±632.7	2,553.0±400.0	<.001
Birth weight twin B	2,269.0±665.6	2,449.6±400.1	.005
Twin A 1-min Apgar score less than 7	6 (3.8)	1 (0.8)	.132
Twin A 5-min Apgar score less than 7	0 (0)	1 (0.8)	.453
Twin A arterial cord pH less than 7.2	3 (1.9)	1 (0.8)	.629
Twin B 1-min Apgar score less than 7	4 (2.5)	12 (9.2)	.019
Twin B 5-min Apgar score less than 7	1 (0.6)	4 (3.1)	.180
Twin B arterial cord pH less than 7.2	4 (2.5)	2 (1.5)	.693

Data are mean±standard deviation or n (%).

ean delivery for twin pregnancies in the United States was 67%.⁹ Although our overall cesarean delivery rate for twin pregnancies of 61.3% is comparable to the population rate, only 15.4% of patients who planned a vaginal delivery had a cesarean delivery. This indicates that through our counseling and prenatal care of twin pregnancies, we were able to select the best candidates for a trial of labor. Active management of the second stage of labor, including breech extraction of the second twin and internal version of a nonengaged second twin, resulted in no patients requiring a cesarean delivery for the second twin after vaginal delivery of the first twin. This is comparable with the findings of Schmitz et al,⁴ who found a 0.5% rate of combined vaginal–cesarean delivery among a cohort of French patients managed similarly in the second stage. Without active management of the second stage, the likelihood of a combined vaginal–cesarean delivery can be as high as 6–10%.^{6,7} Therefore, the active management of the second stage seems to significantly decrease the likelihood of this outcome.

Table 3. Outcomes in Planned Vaginal Delivery Group by Mode of Delivery

	Cesarean Delivery (n=20)	Vaginal Delivery (n=110)	P
Twin A 1-min Apgar score less than 7	0 (0)	1 (0.9)	>.999
Twin A 5-min Apgar score less than 7	0 (0)	1 (0.9)	>.999
Twin A arterial cord pH less than 7.2	1 (5.0)	0 (0)	.155
Twin B 1-min Apgar score less than 7	2 (10)	10 (9.1)	>.999
Twin B 5-min Apgar score less than 7	1 (5.0)	3 (2.7)	.492
Twin B arterial cord pH less than 7.2	1 (5.0)	1 (0.9)	.285

Data are n (%).

Like Schmitz et al, we follow a strict protocol for our twin pregnancies in labor. Our labor floor has 24-hour in-house pediatric and anesthesia coverage. We are able to monitor both fetuses continuously, and ultrasonography is readily available for assistance. Therefore, our good outcomes may be partially due to the level of overall care available, and should not be extrapolated to other less-intense hospital settings or birthing centers.

We found that, among women who attempted vaginal delivery, younger women and women with a prior vaginal delivery were more likely to have a successful vaginal delivery. Advanced maternal age is a known risk factor of cesarean delivery in singleton pregnancies.^{10–12} We have also previously reported an increased risk of cesarean delivery in older women in twin pregnancies specifically.¹³ Therefore, in counseling patients with twin pregnancies about mode of delivery, maternal age should be considered when discussing the likelihood of successful vaginal delivery.

A limitation to this study is its retrospective design. It is difficult to ascertain retrospectively why certain patients elected to undergo planned cesarean delivery, and it is uncertain whether our results can be generalized to all twin pregnancies without contraindications to labor. The results of a prospective trial are awaited with interest. However, the results of our study add support to active second-stage management of twin pregnancies. Similar to what was found in French patients,⁴ in our U.S. population, active second-stage management was associated with good neonatal outcomes and no combined vaginal–cesarean deliveries. We conclude that in a selected and well-informed population, this management is appropriate.

REFERENCES

1. Martin JA, Kung HC, Mathews TJ, Hoyert DL, Strobino DM, Guyer B, et al. Annual summary of vital statistics: 2006. *Pediatrics* 2008;121:788–801.



2. Rabinovici J, Barkai G, Reichman B, Serr DM, Mashiach S. Randomized management of the second nonvertex twin: vaginal delivery or cesarean section. *Am J Obstet Gynecol* 1987; 156:52–6.
3. Barrett JF. Randomised controlled trial for twin delivery. *BMJ* 2003;326:448.
4. Schmitz T, Carnavalet Cde 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.
5. Cruikshank DP. Intrapartum management of twin gestations. *Obstet Gynecol* 2007;109:1167–76.
6. Yang Q, Wen SW, Chen Y, Krewski D, Fung Kee Fung K, Walker M. Occurrence and clinical predictors of operative delivery for the vertex second twin after normal vaginal delivery of the first twin. *Am J Obstet Gynecol* 2005;192:178–84.
7. Wen SW, Fung KF, Oppenheimer L, Demissie K, Yang Q, Walker M. Occurrence and predictors of cesarean delivery for the second twin after vaginal delivery of the first twin. *Obstet Gynecol* 2004;103:413–9.
8. Peacemann 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.
9. Carroll MA, Yeomans ER. Vaginal delivery of twins. *Clin Obstet Gynecol* 2006;49:154–66.
10. Peipert JF, Bracken MB. Maternal age: an independent risk factor for cesarean delivery. *Obstet Gynecol* 1993;81:200–5.
11. Ecker JL, Chen KT, Cohen AP, Riley LE, Lieberman ES. Increased risk of cesarean delivery with advancing maternal age: indications and associated factors in nulliparous women. *Am J Obstet Gynecol* 2001;185:883–7.
12. Main DM, Main EK, Moore DH II. The relationship between maternal age and uterine dysfunction: a continuous effect throughout reproductive life. *Am J Obstet Gynecol* 2000;182: 1312–20.
13. Fox NS, Rebarber A, Dunham SM, Saltzman DH. Outcomes of multiple gestations with advanced maternal age. *J Matern Fetal Neonatal Med* 2009;22:593–6.



Submit Your Manuscript to *Obstetrics & Gynecology*

To submit your manuscript, visit Editorial Manager™ at <http://ong.editorialmanager.com>

First-time users: Click the “Register” button on the menu bar and enter the requested information. Upon successful registration, you will be sent an e-mail with instructions to verify your registration.

Authors: Click the “Login” button on the menu bar and log in to the system as “Author.” Then submit your manuscript and track its progress through the system.

Instructions for authors, a submission checklist, and an author agreement form are available online at <http://ong.editorialmanager.com>.

rev 4/2009

