Predictors of failed operative vaginal delivery: a single-center experience

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OBJECTIVE: The purpose of this study was to identify factors that predict operative vaginal delivery.

STUDY DESIGN: A retrospective cohort study was conducted that included all women who underwent a trial of operative vaginal delivery between 1993 and 2006 at a major tertiary center.

RESULTS: Operative vaginal delivery was attempted in 5120 of 83,351 deliveries (6.1%): 4299 vacuum extractions (84.0%) and 821 forceps deliveries (16.0%). Failures occurred in 8.6% of trials, more often with vacuum extraction (10.0% vs 1.3%; $P < .001$). Most vacuum extraction failures (72.6%) were followed by a trial of forceps delivery, which failed in 3.5% of cases. On multivariate logistic regression analysis, the use of forceps (vs vacuum; odds ratio [OR], 0.4; 95%CI, 0.2-0.7) and administration of analgesia (epidural: OR, 0.4 [95% CI, 0.2-0.7]; intravenous opiates: OR, 0.2 [95%CI, 0.1-0.6]) were associated with a lower risk of failure, persistent occiput posterior position (OR, 2.2; 95% CI, 1.4-3.5) and birthweight >4000 g (OR, 2.8; 95% CI, 1.6-4.9), with a higher risk.

CONCLUSION: Fetal weight and head position should be evaluated carefully before operative vaginal delivery, and the use of analgesia should be encouraged.

Key words: forceps, operative vaginal delivery, vacuum extraction

Cite this article as: Ben-Haroush A, Melamed N, Kaplan B, Yogev Y. Predictors of failed operative vaginal delivery: a single-center experience. Am J Obstet Gynecol 2007;197:308.e1-308.e5.

Operative vaginal delivery (OVD), either with forceps or vacuum-assisted, is used to facilitate childbirth and to avoid cesarean section delivery (CS) and its associated morbidities. Nevertheless, operative techniques are associated with a greater tendency for birth injury than spontaneous delivery.[1] Furthermore, failed OVD followed by CS is associated with significantly higher rates of subdural or cerebral hemorrhage, convulsions, and mechanical ventilation than is spontaneous delivery or successful vacuum extraction (VE).[2] Prompted by these findings, we sought to identify maternal and fetal factors that are associated with failed OVD to prevent excessive morbidity.

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Presented at the 27th Annual Clinical Meeting, of the Society for Maternal–Fetal Medicine, Feb. 5-10, 2007, San Francisco, CA.

Received Mar. 2, 2007; revised May 15, 2007; accepted June 27, 2007.

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0002-9378/$32.00
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doi: 10.1016/j.ajog.2007.06.051

Materials and Methods

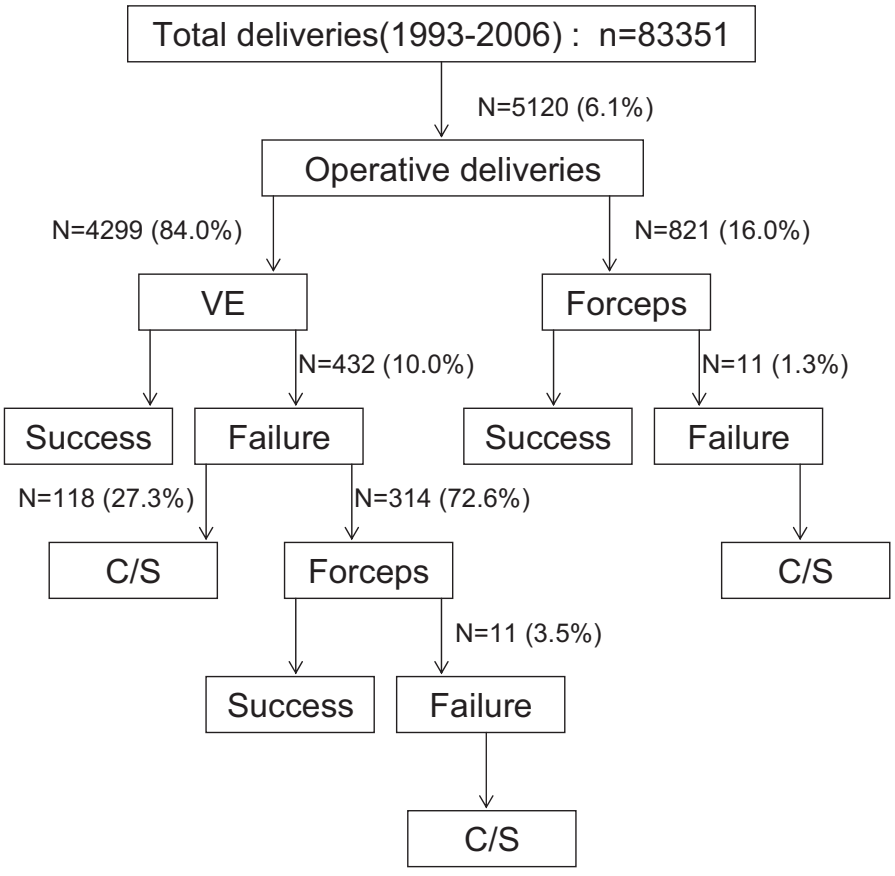
A retrospective cohort study was conducted that included all women who underwent a trial of OVD between 1993 and 2006 at our university-affiliated tertiary medical center. The study protocol was approved by the local institutional review board.

The indications for OVD at our center are prolonged second stage, as stipulated in the guidelines of the American College of Obstetricians and Gynecologists for nulliparous and multiparous women,[3] and nonreassuring fetal heart rate. We performed only low or outlet instrumental deliveries as defined by the American College of Obstetricians and Gynecologists.[3] Mid and rotational deliveries were prohibited. The choice of VE or forceps delivery for the initial attempt was left to the discretion of the attending physician. In most cases, metal-cup vacuum extractors (5-6 cm in diameter) were used. In the absence of epidural analgesia, local infiltration usually was added. *Failed VE* is defined as 2 cup detachments or no progression of the fetal head, despite appropriate traction. In cases of failed VE, either a CS or a trial of forceps delivery was performed.

Data for the study were drawn from the computerized birth certificate records and their linked maternal/child hospital discharge records. All cases in which a singleton infant was born by CS and had a code for OVD (VE or forceps) on the birth certificate were entered into the study group. Cases in which OVD was performed successfully constituted the control group.

Outcome was compared between failed and successful vacuum delivery, failed and successful forceps delivery, and failed and successful OVD (whole sample). Statistical analyses included the Student's *t* test, chi-square test, and multivariate logistic regression. Differences were considered significant when the probability value was <.05. All data were managed and analyzed with the SPSS software (version 15.0 for Windows; SPSS Inc, Chicago, IL).

FIGURE
Outcome of OVDs between the years 1993-2006



C/S, cesarean section; *VE*, vacuum extraction.

Ben-Haroush. Predictors of failed operative vaginal delivery: a single-center experience. AJOG 2007

Results

OVD was attempted in 5120 of the total 83,351 deliveries (6.1%) that were performed at our center during the study period (Figure). VE was used more often than forceps as the initial procedure (84.0% vs 16.0%; $P < .001$).

Primary failure of OVD occurred in 8.6% of cases (Figure) and was significantly more common with VE than with forceps delivery (10.0% vs 1.3%; $P < .001$). CS was performed in all cases of failure of primary forceps delivery. When VE failed, a trial of forceps delivery was undertaken in 72.6% of the cases; the secondary failure rate was 3.5% (Figure). CS was performed in 27.4% of patients with primary VE failure and in all patients in whom the post-VE trial with forceps delivery failed as well. Comparison of the failed and successful OVD groups (whole sample and by specific technique) yielded no differences in baseline characteristics (Table 1).

On univariate analysis, the failed OVD group (whole sample) was characterized by higher rates of birthweight >3500 g and >4000 g, absence of systemic or regional analgesia during labor (epidural or intravenous opiates), persistent occiput posterior position, and less frequent use of episiotomy (Table 2). Similar findings were noted on separate analysis of the cases in which VE was the initial procedure. In the primary forceps delivery group, failure was associated only

TABLE 1
Characteristics of the women with failed and successful OVDs

	VE			Forceps			Overall		
Characteristic	Success (n = 4170)	Failure (n = 129)	*P* value	Success (n = 810)	Failure (n = 11)	*P* value	Success (n = 4980)	Failure (n = 140)	*P* value
Age (y)*	28.4 ± 4.7	27.9 ± 4.6	.5	28.2 ± 4.8	32.4 ± 5.6	.25	28.4 ± 4.7	28.3 ± 4.8	.78
Parity (n)*	1.2 ± 0.6	1.3 ± 0.8	.11	1.2 ± 0.6	1.3 ± 0.6	.69	1.2 ± 0.7	1.3 ± 0.8	.1
Nulliparity (n)	3370 (81%)	105 (81%)	.87	639 (79%)	8 (73%)	.62	4009 (80%)	113 (81%)	.9
Previous cesarean delivery (n)	284 (7%)	11 (9%)	.45	43 (5%)	1 (9%)	.58	327 (7%)	12 (9%)	.34
Gestational age (wk)*	39.5 ± 1.6	39.6 ± 1.3	.15	39.3 ± 1.6	39.5 ± 0.9	.22	39.4 ± 1.6	39.6 ± 1.3	.07
Preterm delivery (n)	146 (4%)	2 (2%)	.23	40 (5%)	0	.45	186 (4%)	2 (1%)	.15

* Data are presented as mean ± SD.

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