External Cephalic Version: Predictors of Success

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***Objective*: To evaluate predictive variables for successful external cephalic version.**

***Methods*: During 1987–1996, 128 women had external cephalic version attempts. Uterine tone, fetal spine position, breech location, breech type, gestational age, placental location, parity, maternal weight, amniotic fluid index, and estimated fetal weight were evaluated as predictors of success.**

***Results*: Seventy-eight (64%) women were successfully converted from breech to vertex presentation. All subjects with low uterine tone had successful version. In women with high uterine tone, the combination of anterior or lateral fetal spine, noncornual placental location, and breech location out of the pelvis predicted success. Other independent variables associated with successful version included nonfrank breech presentation, gestational age under 38 weeks, and parity of at least 1.**

***Conclusion*: Uterine tone may be the most important predictor of success when selecting candidates for external cephalic version. (Obstet Gynecol 1999;94:783–6. © 1999 by The American College of Obstetricians and Gynecologists.)**

During the 1950s, interest in external version declined after reports of fetal death and maternal morbidity.[1] Early procedures often involved preterm fetuses, general anesthesia, and inappropriate fetal monitoring. By the 1960s, vaginal delivery was the generally accepted approach to breech presentation. By the 1970s, studies suggested increased neonatal morbidity and birth injury with breech delivery.[2] Those apprehensions in an intensified medicolegal atmosphere led to a strong trend away from the teaching and use of breech vaginal delivery. An *ACOG Technical Bulletin* in 1986 stated that "the controversies related to breech birth cannot be answered by a consensus statement at this time. . . ."[3] A 1988 survey of the Society of Perinatal Obstetricians found that 14% thought there was "adequate scientific documentation demonstrating that cesarean section is the preferred mode of delivery."[4] Most members believed that multicenter randomized trials were needed to establish the optimal mode of delivery. Critics, however, suggested that such studies would be difficult. The overall result has been a dramatic increase in the cesarean rate for breech presentation.

An increasingly popular alternative to cesarean delivery has been renewed interest in external cephalic version. Unfortunately, not all women present with equal chances of a successful procedure, and improved subject selection would reduce procedure costs and increase success rates. The present study was done to assess the relative importance of ten objective variables for predicting successful external cephalic version.

Materials and Methods

During 1987–1996, 128 women with breech presentation were referred to University of New Mexico Hospital or Presbyterian Hospital for external cephalic version evaluation. Each was seen by one of the authors to minimize the variance of operator experience and skill. All procedures were done at or after 37 weeks' gestation. For each subject, ten objective variables were evaluated (Table 1), uterine tone–low (easily palpable fetal head and less than one contraction every 10 minutes) or high (difficult to palpate fetal head or greater than one contraction every 10 minutes); fetal spine position—posterior, anterior, or lateral; breech location—into or out of the maternal pelvis by abdominal examination (cervical examinations were not done); breech type—frank or nonfrank; estimated gestational age — 37 or 38 weeks or greater; placental location—cornual or noncornual; parity—zero or greater than zero; amniotic fluid index (AFI)—less than or greater than or equal to 8 cm; maternal weight–less than or greater than or equal to 69 kg; estimated fetal weight (EFW)—less than or greater than or equal to 3 kg.

Candidates were admitted to labor and delivery for a screening ultrasound examination and nonstress test. Exclusion criteria included placenta previa or history of

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Table 1. Predictors of Successful External Cephalic Version Univariate Analysis

Predictor	Predictor description	Number of subjects	Number of successful subjects	Fisher statistic	*P* for Fisher statistic	Univariate odds ratio (95% CI)
Uterine tone	High	69	19 (28)	85.4	<.001	Undefined
	Low	59	59 (100)			
Fetal spine	Posterior	32	3 (9)	49.2	<.001	34.5 (9.6, 125)
	Anterior/Lateral	96	75 (78)			
Breech location	Into pelvis	13	0 (0)	23.7	<.001	Undefined
	Out of pelvis	115	78 (68)			
Breech type	Frank	38	11 (29)	22.9	<.001	7.15 (3.1, 16.7)
	Nonfrank	90	67 (74)			
Gestational age	≥38 wk	28	8 (29)	15.3	<.001	5.83 (2.3, 14.7)
	37 wk	100	70 (70)			
Placental location	Cornual	7	0 (0)	11.41	<.005	Undefined
	Noncornual	121	78 (64)			
Parity	1	92	51 (55)	4.15	<.05	2.41 (1.02, 5.7)
	0	36	27 (75)			
Amniotic fluid index	<8	20	9 (45)	2.5	.14	2.16 (0.82, 5.7)
	≥8	108	69 (64)			
Maternal weight	≥68 kg	56	30 (54)	2.25	.15	1.73 (0.85, 3.6)
	<68 kg	72	48 (67)			
Estimated fetal weight	≥3000 g	99	60 (61)	0.03	.86	1.06 (0.45, 2.5)
	<3000 g	29	18 (62)			

CI = confidence interval.

vaginal bleeding, AFI of at most 5 cm, fetal anomalies, fetal growth restriction (FGR), previous uterine scar other than low-transverse, nonreassuring nonstress test (defined as a tracing without a classically reactive pattern, an abnormal baseline rate, or significant deceleration patterns), EFW exceeding 4 kg, suspicion of nuchal cord (two directly adjacent cross sections of umbilical cord in the immediate nuchal area) or uterine malformation. Approval for the study was given by the institutional review board, and informed consent was obtained from each subject. Laboratory studies included type and screen and complete blood count. An intravenous infusion was started. Rh immunoglobulin was given to Rh-negative subjects. All subjects received subcutaneous terbutaline (0.25 mg) approximately 5 minutes before the procedure. Women were placed in approximately 10 degrees of Trendelenburg position to facilitate cephalad displacement of the breech. Fetal monitoring was continuous during the procedure. A forward roll was attempted with a single-operator technique. If that was unsuccessful, a backward roll was attempted. If the fetal heart rate (FHR) fell below 100 beats per minute, the procedure was stopped and the fetus was rotated back to its original position. A second attempt was made only after FHR returned to normal. A total of 5 minutes was allowed for each procedure. Procedures were discontinued for any unreasonable maternal discomfort. A nonstress test lasting at least 30 minutes was done at the end of each procedure. Weekly nonstress tests were suggested until delivery. Otherwise, usual obstetric protocol was followed by the referring physicians.

Two analyses of the data were made to predict successful version. The first used a univariate approach to assess the effect of each variable on the likelihood of successful version. Categoric variables were analyzed using Fisher exact probability test (STATXACT 4.0, Cytel Software Corp, Cambridge, MA). The second used a multivariate logistic regression model to control for cross-variable effects among the independent variables and investigate the relative importance of the variables. A backward conditional algorithm was used to select variables for multivariate analysis (SPSS 8.0; SPSS Inc., Chicago, IL). Statistical significance was determined at a level of $P < .05$.

Results

External cephalic version was successful in 78 of 128 subjects (64%). Univariate analysis in Table 1 shows the variables in descending order of statistical significance. Each variable is subcoded into its respective binomial variable description. The most important predictor of success was low uterine tone. As a single objective predictor, all subjects ($n = 59$) with low uterine tone had successful version. Women with high uterine tone ($n = 69$) had a statistically significant risk of failure (50 of 69) ($P < .001$). Uterine tone was assessed 5 minutes after subcutaneous terbutaline. Other independent variables associated with success were anterior or lateral

Table 2. Predictors of Successful External Version Multivariate Analysis

Predictor	β coefficient	Adjusted odds ratio (95% CI)
Uterine tone	11.6	Undefined*
Fetal spine	3.5	33.9 (3.5, 324)
Breech location	12.1	Undefined*
Breech type	1.6	4.7 (0.8, 27.5)
Gestational age	1.9	6.7 (0.8, 52.6)
Placental location	11.0	Undefined*
Constant	−28.5	

CI = confidence interval.
* Odds ratio undefined when one or more conditions of variable description and success/failure is zero (see Table 1).

spine ($P < .001$), breech out of the pelvis on abdominal examination ($P < .001$), nonfrank breech presentation ($P < .001$), gestational age less than 38 weeks ($P < .001$), noncornual placenta ($P < .005$), and parity greater than zero ($P < .05$). Maternal weight, EFW, and AFI were not significant predictors. Most version attempts were made at 37 weeks' gestation. Conclusions about gestational age are, therefore, not valid. Estimated fetal weights greater than 4 kg were excluded from the study, making conclusions about fetal macrosomia impossible. Women with severe oligohydramnios also were excluded, rendering conclusions about that subgroup impossible.

A multivariate analysis, done to control for cross-variable effects of each independent variable (Table 2), confirmed many of the univariate analyses. Uterine tone, breech location, and placental location were significant predictors of success. There were no significant interactions between any two predictors. The Hosmer and Lemeshow goodness-of-fit statistic was 0.9242, indicating an excellent fitting model. Of the 78 successful cases, 75 were assigned probabilities greater than 0.50 using our model. With the probability of 0.50 as a cutoff, 93% of cases were classified correctly in predicting success or failure.

There was transient fetal bradycardia during version attempts in 20 subjects. The procedure was abandoned in five women due to recurrent fetal bradycardia. In each case, bradycardia resolved spontaneously. There were no maternal complications. No cesarean deliveries were necessary.

Postpartum data were obtained from the referring physicians. Fifty-eight (74%) of the women with successful version had vaginal deliveries. The remaining 20 had cesarean deliveries for fetal intolerance of labor or arrest disorders. Forty of 50 with unsuccessful version attempts had cesarean deliveries for persistent breech presentation. There was spontaneous conversion to vertex presentation and vaginal delivery in two cases.

Discussion

There has been a resurgence in popularity of external cephalic version over the last decade resulting from multiple factors. First, fewer residents are being adequately trained in breech vaginal delivery. Additionally, obstetrics has changed in a medicolegal environment in which many consider breech vaginal delivery a liability. External cephalic version also has become a safer procedure with minimal maternal and fetal risks. Finally, health care providers have been pressured to consider the economic impact of cesarean birth. The financial burden imposed by cesarean delivery for all breech presentations has been estimated at $1.4 billion annually.[5] Assuming routine use of external cephalic version and a success rate of 50%, the cesarean rate could be reduced more than 1%, saving millions of dollars annually.[6] Improvements in subject selection would reduce costs of failed procedures while improving numbers of successful procedures. Physicians' skills also would be expected to improve with a more liberalized attitude toward external version.

Previous studies have examined maternal and fetal factors related to successful external cephalic version.[7–11] The predictors have varied from study to study and conclusions have been inconsistent. The present study attempted to examine a comprehensive list of objective variables (Table 1). Low uterine tone, defined as less than six contractions per hour and easily palpable fetal head, was an important predictor of success. A relaxed uterus allows the operator to reposition and guide the fetus easily. We believe that a key component to a successful and safe external version is a gentle approach. Protracted and aggressive attempts do not improve success and can lead to increased maternal and fetal morbidity. Low uterine tone allows the external version to proceed with less physical effort and less patient discomfort. Although there are reports of successful external version in laboring women,[12] uterine activity sufficient to cause descent of the breech into pelvis has been associated with failure.[9] Success in these cases likely depends on sufficient uterine relaxation between contractions and an unengaged presenting part. In our study, success in women with increased uterine tone was predicted by an anterior or lateral fetal spine, a noncornual placenta, and/or breech out of the pelvis.

A number of facilitators for external version have been described. Fetal acoustic stimulation has been reported and might aid in repositioning the fetus with a midline fetal spine.[13] Maternal tilting exercises might also be beneficial. Using tocolytics in external cephalic version is controversial.[14–16] In the present investigation, subcutaneous terbutaline appeared to reduce and

stabilize uterine tone in several women. Future studies are necessary to focus objectively on the use of tocolytics and uterine tone and to investigate the possible use of other tocolytic agents.

All women in the present study were at or beyond 37 weeks' gestation. Studies involving term subjects have reported maternal or fetal complications in 1–2%.[7] Although better success rates have been reported earlier than 37 weeks,[17] to prevent iatrogenic preterm problems we suggest that external version be done at term in a hospital. Induction of labor immediately after external version has been discouraged as incidence of compound presentation might be increased.[18] There are reports of increased cesarean rates in women who have undergone successful version.[19,20] In our series, the cesarean rate was 24%. The most common indication was secondary arrest of cervical dilation. Our institution baseline cesarean rate was 16–17%.

Obstetricians should consider external cephalic version in women with breech presentation at term. In busy hospitals, it might be appropriate to appoint two or three experienced physicians to evaluate subjects. Careful evaluation of individual predictors can optimize patient selection and success rates.

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