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CLINICAL ARTICLE

A prospective study of the factors associated with the success rate of external cephalic version for breech presentation at term

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ABSTRACT

Objective: To determine the factors associated with the success rate of external cephalic version (ECV) for breech presentation at term. *Methods:* A prospective analysis of 500 ECV maneuvers. The variables maternal age, maternal weight, body mass index, previous cesarean delivery, gestational age, parity, amount of amniotic fluid, placental location, and type of breech were studied using logistic regression analysis. *Results:* The success rate of ECV was 52.2% (n = 261). The variables significantly associated with success were parity, placental location, amount of amniotic fluid, and type of breech ($P<0.05$). A parity of 2 had a 3.74-times higher probability of success than nulliparity (95% CI, 2.37–5.90); a posterior placenta increased the success rate by 2.85 times compared with an anterior placenta (95% CI, 1.87–4.36); and double footling breech presentation had a 2.77-times higher success rate compared with a frank breech presentation (95% CI, 1.16–6.62). The area under the ROC curve showed a predictive ability of 73.6% (95% CI, 69.2%–77.9%) for these 3 variables. *Conclusion:* Parity, placental location, amount of amniotic fluid, and type of breech presentation were associated with the success rate of ECV.

1. Introduction

External cephalic version (ECV) is a maneuver performed to modify fetal presentation to cephalic. Although the technique has been known for hundreds of years, only since publication of the results of the Term Breech Trial [1] and the increased use of cesarean delivery as the recommended birth method for breech presentation, has it increased in importance.

The aim of the present study was to determine the factors associated with the success rate of ECV for breech presentation at term.

2. Materials and methods

A total of 500 ECVs performed at the Cruces University Hospital, Vizcaya, Spain from March 1, 2002 to March 31, 2008, were analyzed prospectively. Patients with breech presentation were recruited at 36 weeks of gestation during antenatal consultations and were admitted to hospital to undergo ECV from week 37. Inclusion criteria to undergo ECV were a singleton pregnancy at 37 weeks of gestation or longer, a live fetus in a breech position, and no contraindications to vaginal birth. Exclusion criteria were the presence of placenta previa, placental abruption, oligohydramnios, fetal compromise, fetal death, severe fetal malformation, multiple gestation, Rhesus sensitization, uterine abnormalities, and clotting disorders. The study received approval from institute's Ethics Committee and informed consent was obtained from each patient.

On the day of the scheduled ECV, eligible participants attended under fasting conditions and an ultrasound scan was performed to estimate fetal weight, type of breech, placental location, and amount of amniotic fluid. ECV was performed—in a delivery room adjacent to the operating theatre—following intravenous injection of ritodrine (200 μg/min for 30 minutes), under ultrasound assessment and with the patient in a slight Trendelenburg position. Fetal heart rate monitoring was used to assess fetal well-being before and after the procedure. A change in presentation from podalic to cephalic was considered a success.

Maternal age, maternal weight, body mass index (BMI, calculated as weight in kilograms divided by height in meters squared), previous cesarean delivery, gestational age, parity, amount of amniotic fluid, placental location, and type of breech were analyzed. These data were collected on the same day immediately before performing ECV.

The maximum modeling strategy in logistic regression was used, whereby the sample should be at least 10 times as large as the number

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of variables to be analyzed. As 9 variables were to be analyzed, the sample size was considered sufficient. Data were managed using a computerized database, and descriptive and logistic regression analyses were performed using SPSS version 17 (SPSS, Chicago, IL, USA). $P<0.05$ was considered statistically significant.

3. Results

The characteristics of the 500 study participants who underwent ECV are shown in Table 1. The overall success rate of ECV during the study period was 52.2% (n = 261).

The success rate of ECV was 41.6% (139/334) in nulliparous women, while the figure was 71.9% (100/139) for women who had a parity of 2. For placental location, the highest success rate was obtained when the placenta was located in a posterior position (62.1%; 151/243). For type of breech, the highest success rate was achieved for a double footling presentation (73.5%; 25/34), followed by complete presentation (59.8%; 73/122). The success rate among the 24 patients who had previously had a cesarean delivery was 70.8% (n = 17).

To determine the variables that were associated with the success rate of the procedure, logistic regression analysis was performed. According to the results of this analysis, the variables that were significantly associated with the success of ECV were parity ($P<0.01$), placental location ($P<0.01$), amount of amniotic fluid ($P<0.05$), and type of breech ($P<0.01$) (Table 1).

Logistic regression analysis results performed for the variables significantly associated with successful ECV are shown in Table 2. A parity of 2 had a 3.74-times higher probability of success than nulliparity (95% CI, 2.37–5.90); a posterior placental location increased the success rate by 2.85 times compared with an anterior placenta (95% CI, 1.87–4.36); and a double footling breech presentation had a 2.77-times higher success rate compared with a frank breech presentation (95% CI, 1.16–6.62).

The area under the ROC curve showed a predictive ability of 73.6% for these 3 variables (95% CI, 69.2%–77.9%) (Fig. 1).

Table 1
Characteristics of the participants who underwent external cephalic version (n = 500).[a]

Characteristics	Value	Success rate of ECV	*P* value
Maternal age, y	32.32 ± 4.37		0.12
Maternal weight, kg	75.14 ± 11.75		0.51
Body mass index	28.33 ± 4.13		0.42
Gestational age, wk	37.49 ± 0.89		0.65
Parity			<0.01
0	334 (66.8)	139 (41.6)	
2	139 (27.8)	100 (71.9)	
3+	27 (5.4)	22 (81.5)	
Previous cesarean delivery			0.91
Yes	24 (4.8)	17 (70.8)	
No	476 (95.2)	244 (51.3)	
Placental location			<0.01
Anterior	205 (41)	84 (41.0)	
Posterior	243 (48.6)	151 (62.1)	
Fundal-lateral	52 (10.4)	26 (50.0)	
Type of breech			<0.01
Complete	122 (24.4)	73 (59.8)	
Incomplete	46 (9.2)	20 (43.5)	
Double footling	34 (6.8)	25 (73.5)	
Frank	298 (59.6)	143 (48.0)	
Amount of amniotic fluid			<0.05
Scarce	33 (6.6)	10 (33.0)	
Normal	452 (90.4)	240 (53.1)	
Abundant	15 (3.0)	12 (80.0)	
Estimated fetal weight, g	3004 ± 360		

[a] Values are given as mean ± SD or number (percentage).

Table 2
Logistic regression analysis for the variables significantly associated with success of ECV.

Variable	B	SE	Wald	df	*P* value	Exp(B)	95% CI for EXP (B)
Parity							
0			37.76	2	<0.01		
2	1.32	0.23	32.16	1	<0.01	3.74	2.37–5.90
3+	1.57	0.54	8.65	1	<0.01	4.82	1.69–13.73
Placental location							
Anterior			24.20	2	<0.01		
Fundal-lateral	0.29	0.34	0.78	1	0.37	1.35	0.69–2.62
Posterior	1.04	0.22	23.64	1	<0.01	2.85	1.87–4.36
Type of breech							
Frank			10.46	3	<0.01		
Complete	0.61	0.24	6.26	1	0.01	1.83	1.14–2.93
Incomplete	–0.04	0.34	0.01	1	0.91	0.96	0.49–1.89
Double footling	1.02	0.45	5.23	1	0.02	2.77	1.16–6.62
Amount of amniotic fluid							
Scarce			6.94	2	0.03		
Normal	0.83	0.43	3.82	1	0.05	2.30	0.99–5.31
Abundant	2.01	0.80	6.30	1	0.01	7.44	1.55–35.65

Abbreviations: B, coefficient for the constant; SE, standard error; Wald, Wald X^2 test; df, degrees of freedom; Exp(B), the exponentiation of the B coefficient.

4. Discussion

Numerous studies have investigated the factors that affect the success rate of ECV; however, the majority of studies differ considerably in methodological quality and sample size. We performed a literature review and were unable to find a single factor that was common to all studies; some factors that were found to be associated with ECV success were reported to have no effect on the success rate in other studies. Furthermore, the statistical analyses used in some studies were not always the most appropriate to reach a valid conclusion. In this respect, we believe that logistic regression analysis is the most appropriate technique for this type of study.

The variables most commonly used in previous studies were maternal age, maternal weight, BMI, amount of amniotic fluid, placental location, type of breech (footling, frank, complete, incomplete), and fetal weight estimated by ultrasound. Table 3 summarizes the results of previous studies [2–20], and shows the wide inter-study variability.

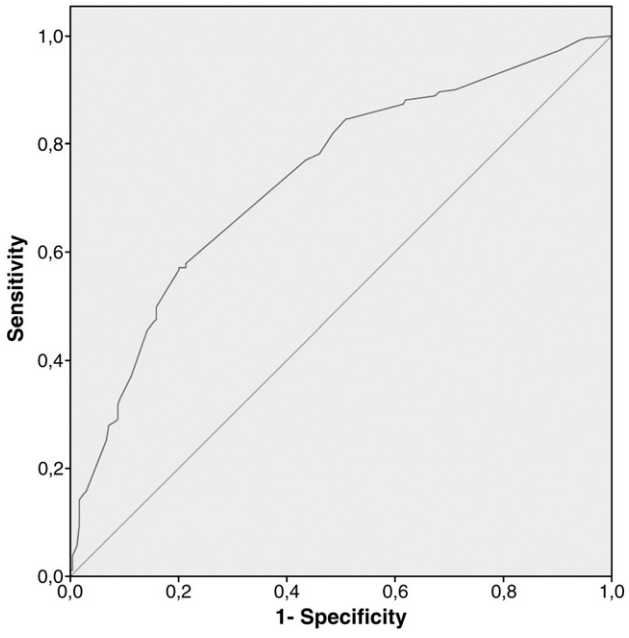

Fig. 1. Receiver operating characteristic curve.

Table 3
Review of studies performed to determine the factors associated with the success rate of external cephalic version.

Study	Year	Parity	Maternal weight	BMI	Placental location	Amniotic fluid	Type of breech	Fetal weight
Ferguson et al. [2]	1987	+	–		+	+	+	–
Fortunato et al. [3]	1988	–	+	+	–	+	–	–
Hellstrom et al. [4]	1990	+		–	–	+	+	
Newman et al. [5]	1993	+		–	+			+
Shalev et al. [6]	1993	–		–	–	+	–	+
Kainer et al. [7]	1994				–	–	+	–
Ben-Arie et al. [8]	1995	+			–	+		+
Flock et al. [9]	1998	+	+			+		
Aisenbrey et al. [10]	1999	+			+		+	–
Ezra et al. [11]	2000	+		–	–	–	–	–
Ruangchainikom and Chareonporn [12]	2001	–	–	–	–	+	–	+
Lojacono et al. [13]	2003	–			–	–	–	
Le Bret et al. [14]	2004				+	+	+	
Weiniger et al. [15]	2007		–		–		+	–
Rueangchainikhom et al. [16]	2008	–	–		–			+
Ben-Meir et al. [17]	2008	+		+	+	+	+	
Kok et al. [18]	2008	+	+					–
Tasnim et al. [19]	2009	+				+		–
Burgos et al. [20]	2009							–

Key: "+" factor affecting the success rate of ECV; "–" factor with no effect on the success rate of ECV.

Other factors might affect the success rate of ECV, but are more difficult to measure. These include fundal height, palpation of the fetal pole, degree of fetal engagement, and tone of the uterus on palpation. These variables were studied by Lau et al. [21], who concluded that they were associated with the success rate of ECV. Newman et al. [5] found a similar positive association and included these factors in an outcome prediction score.

More recently, Kok et al. [22] performed a meta-analysis of 53 studies, involving more than 10 000 women, to determine the clinical characteristics affecting the success of ECV. Thirty-four (64%) of 53 studies had a prospective design, 36 (67%) were cohort studies, and in 43 the procedure was performed with tocolytic medication. The authors concluded that multiparity, nonengagement, a relaxed uterus, a palpable fetal head and low maternal weight (<65 kg) increased the success rate of ECV, whereas neither fundal height nor gestational age had any effect on success. The same authors performed an additional meta-analysis of 37 studies, involving more than 7000 women [23], to determine the ultrasound factors affecting the success of ECV. In this analysis, fetal position, amount of amniotic fluid, and placental location were found to affect the success rate.

It is clear from the literature that a large number of variables have been studied and that the results vary. The results of the present study indicated that, for our cohort, the only variables associated with the success of ECV were parity, placental location, amount of amniotic fluid, and type of breech presentation. The other variables assessed, namely maternal age, maternal weight, BMI, gestational age, and previous cesarean delivery had no effect on the success rate of ECV. It should be noted that, according to the standardized reference tables used to estimate obesity, the mean BMI for our study group was grade II overweight (Table 1); however, because a mean weight increase of 9 kg would be expected during pregnancy, this situation should be considered to be nonpathological. Calculation of prepregnancy BMI, using maternal weight and subtracting the expected mean 9-kg weight increase during pregnancy, gave a BMI of 24.9, which is normal according to standardized reference tables.

The finding that gestational age at term does not affect success rate is also important; the procedure could be indicated, with no reduction in the likelihood of success, if the patient is recruited after week 37.

Previous cesarean delivery is a relative contraindication for ECV. The majority of studies did not include this group of patients. In our series, 70.8% (n = 17) of the 24 patients who had undergone a previous cesarean delivery underwent ECV successfully. Uterine scarring does not appear to affect the success rate and we observed no other complications in these patients. The recent studies by Sela et al. [24] and Abenhaim et al. [25] reported similar results.

Fetal weight estimated by ultrasound has been studied in various ways, for example as a continuous variable [2], according to different categories [6,9], or using the Fisher exact test [10], χ^2 test [11], or logistic regression analysis [17]. We consider that study of this variable, in light of its nature, requires a specific study design. Accordingly, we designed a specific study to determine its effect on the success rate of ECV, but no association was found [20].

The amount of amniotic fluid, classified as scarce, normal, or abundant, was found to have an effect on the success rate of ECV in the present study. Previous studies have also reported this finding [2–4,6,8,9,12,14,17,19], whereas others found no such relationship [7,11,13]. These differences arise as a result of various factors, the most important of which is likely to be the different methods used to measure the amount of fluid and its subsequent coding.

In conclusion, the results of the present study indicate that the factors associated with the success rate of ECV are parity, placental location, amount of amniotic fluid, and type of breech presentation. The predictive ability of these variables was 73.6%.

Conflict of interest

The authors have no conflicts of interest to disclose.

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