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MATERNAL-FETAL MEDICINE

Late preterm versus term external cephalic version: an audit of a single obstetrician experience

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Abstract

Purpose Recent literature evaluating the optimal timing for external cephalic version (ECV) in non-cephalic presentation is limited and hampered by methodological issues. We aimed to compare late preterm ECV [term (36–37 weeks of gestation] to term ECV (> 37 weeks).

Methods We conducted a retrospective cohort study of prospectively collected data of ECV procedures performed by a single operator during a 6 year period. Maternal, ECV procedure, delivery and fetal characteristics were compared between preterm ECV and term ECV.

Results Overall, 547 (91.6%) of ECVs were term ECV while 50 (8.4%) procedures were preterm ECV. Success rate of ECV was 72.0% in the preterm ECV group vs. 71.5% in the term ECV group, $p = 0.93$. Proportion of preterm delivery was higher among the preterm ECV group (8% vs. 0%, $p < 0.001$), so does the proportion of early term deliveries (36.0% vs. 22.8%, $p = 0.03$). The rate of low birth weight was higher among the preterm ECV group (10.0% vs. 3.11%, $p = 0.01$). Rates of Apgar score at 5 min ≤ 8 were higher in the preterm ECV (4.0% vs. 0.5%, $p = 0.007$). Vaginal delivery and intrapartum cesarean delivery rates did not differ between study groups (72.0% vs. 73.2%, $p = 0.83$ and 10% vs. 8.4%, $p = 0.69$).

Conclusion Initiating ECV before term is associated with increased rate of preterm delivery, early term delivery and low birth weight. No effect was found in mode of delivery, intrapartum cesarean delivery, reversion and spontaneous version. We advocate against preterm ECV until future prospective trials will better delineate the effect of preterm ECV on maternal and neonatal outcomes.

Keywords Breech · External cephalic version · Malpresentation · Placenta · Term · Timing

Abbreviation

ECV External cephalic version

Introduction

Non-cephalic fetal presentation at term occurs in up to 4% of gestations [1, 2]. Being a common indication for an elective cesarean delivery [3, 4], prevention of non-cephalic presentation by an external cephalic version (ECV) has been shown to safely reduce the need for caesarean section [5–9].

Antenatal detection of non-cephalic presentation in third trimester is an important measure for its timely management and clinical decision making regarding the performance of an ECV [10], as diagnosis of non-cephalic presentation after the onset of labor carries increased maternal and infant morbidity and mortality [11].

Published series and meta-analyses regarding the timing of ECV have found that ECV at term (> 37 weeks of gestation) reduces the number of cesarean deliveries performed for non-cephalic presentations [5, 8, 12–17], and that performance of preterm ECV may have similar benefit, however, carries an increased risk of late preterm birth [18].

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Nevertheless, most of literature comparing preterm to term ECV derives from studies performed more than two decades ago, based on relatively small cohorts and involving the bias of many physicians performing the ECV [19–24].

Given the abovementioned, we aimed to evaluate the outcomes of a large cohort of preterm ECV versus term ECV performed by a single operator.

Materials and methods

Patients

This is an audit of prospectively collected data of patients who underwent ECV between during a-6 year period at Bikur Cholim Medical Center in Jerusalem, Israel. The inclusion criteria for the study included women with singleton pregnancy at $>36^{0/7}$ weeks of gestation, who were willing to undergo ECV attempt and were referred to the high-risk pregnancy unit at our center. Exclusion criteria were as follows: placental abruption, placenta previa, active labor, premature rupture of membranes, non-reassuring fetal heart rate patterns and known uterine anomalies (except for arcuate uterus). Patients with a contraindication to vaginal delivery were additionally excluded. Suspected large- or small- for gestational age fetuses (per estimated fetal weight by ultrasound at the day of procedure), were not excluded from the study.

ECV procedure

Examination for eligibility included careful general and obstetric history taking, physical examination (vaginal examination of cervical status e.g. dilatation and effacement), fetal non-stress test for the evaluation of uterine contraction (as depicted on uterine tocograph) and fetal well-being and a detailed sonographic examination of fetal biometry including fetal weight estimation, placental location and amniotic fluid index, which was performed at the day of ECV procedure. According to our protocol, ECV is performed among women with non-cephalic fetal presentation from $36^{0/6}$ weeks in accordance with local guidelines and other publications [17, 18]. Thirty minutes prior to ECV attempt, ritodrine hydrochloride 10 mg was administered intramuscularly as a tocolytic agent [25]. Our protocol precluded utilization of regional anesthesia and it was not used in any of the cases. ECV was performed after confirming clinical significant levels of ritordine in maternal blood serum, evident by maternal resting tachycardia. The procedure was defined as successful if fetal vertex presentation was confirmed by an ultrasound examination immediately following the ECV procedure. In case of ECV failure, it was re-attempted during the same session. All procedures were performed under ultrasound guidance by a single experienced operator (R.N.P.). Once fetal heart rate monitoring was reassuring, the patients were discharged. The aforementioned ECV protocol was strictly and uniformly applied to all patients during the whole study period.

Data collection

All data of all ECV procedures were collected and maintained in a prospective database after a real-time input by a database manager. Data collected included—age, obstetric history, gestational age, amniotic fluid index, placental location, estimated fetal weight, breech type, number of ECV attempts, Signs of uterine activity (uterine contractions, cervical effacement and dilatation) and follow-up data (e.g. presentation at delivery, mode of delivery, birth weight, gestational age at delivery, sex and Apgar scores). Low birth weight was defined as <2500 g. Uterine contractions were defined as any uterine activity evident on uterine tocograph). The majority of patients delivered at our medical center. The minority of women ($n=52$) who gave birth elsewhere, were contacted by phone and data regarding the delivery were obtained and recorded. Validity of these data was confirmed by discharge letters from the other hospitals which served our patients. Institutional Review Board approval waiving informed consent was obtained for this retrospective study by the Helsinki committee of Bikur Cholim Medical Center (IORG0001519).

Statistical analysis

Patient characteristics are described as proportions for categorical variables and median and interquartile range for continuous variables without a normal distribution. Maternal and pregnancy characteristics were compared between late preterm ECV and the term ECV groups. Significance between groups was assessed by the Chi square test and Fisher's exact test for categorical variables and the Mann–Whitney *U* test for continuous variables. A 2-sided p value <0.05 indicated statistical significance. Data were analyzed using Software Package for Statistics and Simulation (IBM SPSS version 22, IBM Corp, Armonk, NY).

Results

During the study period, five hundred ninety seven women carrying a non-cephalic presenting fetus underwent ECV. Of those, 547 (91.6%) were performed after 37 weeks (term ECV) while the other 50 (8.4%) procedures were performed prior to 37 weeks (preterm ECV). Median gestational age at ECV was $38^{0/7}$ in the term ECV group and $36^{0/7}$ in the preterm ECV group. Success rate of ECV was 72.0% in

the preterm ECV group vs. 71.5% in the term ECV group, $p=0.93$.

Baseline characteristics of women, ECV procedures and fetuses in the study groups are presented in Table 1. Parity, nulliparity and the proportion of women with 5 or more deliveries did not differ between study groups.

Mean estimated fetal weight was lower in the preterm ECV group (2755 g vs. 2988 g, $p<0.001$). Median time from ECV to delivery was longer in the preterm ECV group (21 day vs. 13 days, $p<0.001$).

Table 2 summarized the outcomes of ECV procedures. Median gestational age at delivery was lower in the preterm ECV group ($39^{1/7}$ vs. $39^{6/7}$, $p<0.001$). The induction rate did not differ between the groups (6% vs. 10.4%, $p=0.32$). The rate of low birth weight was higher among the preterm ECV group (10.0% vs. 3.11%, $p=0.01$). Proportion of preterm delivery was higher among the preterm ECV group (8% vs. 0%, $p<0.001$), so does the proportion of early term deliveries (36.0% vs. 22.8%, $p=0.03$). Success rate among nulliparous women in the entire cohort was 53.4% as compared to 81.1% among parous ($p<0.001$). Success rate did not differ between preterm ECV and term ECV groups among either nulliparous (65.0% vs. 52.1%, $p=0.27$) or parous (76.6% vs. 81.4%, $p=0.52$) women. Among women with five or more deliveries ($n=101$), success rates did not differ between preterm ECV and term ECV (85.7% vs. 85.2%, $p=0.97$).

Vaginal delivery and intrapartum cesarean delivery rates did not differ between study groups (72.0% vs. 73.2%, $p=0.83$ and 10% vs. 8.4%, $p=0.69$). Apgar score at 1 min ≤ 7 did not differ between study groups (2.0% vs. 2.5%, $p=0.8$). Rates of Apgar score at 5 min ≤ 8 were higher in the preterm ECV (4.0% vs. 0.5%, $p=0.007$). Rates of spontaneous version, reversion and related complications did not differ between preterm ECV and term ECV groups (7.1% vs. 2.5%, $p=0.32$, 0% vs. 1.0%, $p=0.54$, 0% vs. 1.0%, $p=0.92$, respectively).

Table 1 Comparison of patients' characteristics in relation to gestational age at ECV

	Early ECV $n=50$	Term ECV $n=547$	p value
Maternal characteristics			
Age, years	26 [22–29] (27)	27 [23–32] (28)	0.22
Parity	1 [0–4] (2)	2 [0–4] (2)	0.45
Nulliparous	20 (40.0%)	186 (34.0%)	0.39
Parity ≥ 5	7 (14.0%)	95 (17.4%)	0.54
Previous cesarean section	8 (16.0%)	63 (11.5%)	0.28
Body mass index > 30 kg/m^2	0 (0%)	9 (1.6%)	0.36
Gestation characteristics			
Estimated fetal weight, g	2758 [2510–2984] (2755)	2938 [2663–3278] (2988)	< 0.001
Gestational age at ECV, weeks	$36^{0/7}$ [$36^{0/7}$–$36^{4/7}$] ($36^{2/7}$)	$38^{0/7}$ [$37^{2/7}$–$38^{4/7}$] ($38^{0/7}$)	< 0.001
Amniotic fluid index, cm	11 [9–14] (12)	11 [9–14] (12)	0.55
Oligohydramnion	1 (2)	4 (0.7)	0.51
Polyhydramnion	0 (0)	3 (0.5)	0.61
Placental location			0.49
Anterior	20 (40.0%)	234 (42.8%)	
Posterior	24 (48.0%)	212 (39.1%)	
Fundal	6 (12.0%)	90 (16.4%)	
Lateral	0 (0%)	9 (1.7%)	
Breech type			0.38
Frank	50 (100%)	539 (98.5%)	
Transverse	0 (0%)	8 (1.5%)	
Male sex	22 (44.0%)	251 (49.5%)	0.49
Procedure characteristics			
Uterine activity			
Cervical dilatation	7 (14.0%)	143 (26.1%)	0.06
Uterine contractions	6 (12.0%)	109 (19.9%)	0.17
Cervical effacement	8 (16.0%)	154 (28.1%)	0.06

Continuous variables are expressed as median [interquartile range] (mean)

ECV external cephalic version

Table 2 Comparison of outcome in relation to gestational age at ECV

	Early ECV $n=50$	Term ECV $n=547$	p value	Relative risk (95% CI)
Success of procedure				
Success of ECV	36 (72.0%)	391 (71.5%)	0.93	1.00 (0.84–1.20)
Cephalic presentation at delivery	37 (74)	391 (71.5)	0.70	
Delivery characteristics				
Time from ECV to delivery, days	21 [14–28] (20)	13 [7–20] (13)	< 0.001	
Gestational age at delivery, weeks	$39^{1/7}$ [$38^{2/7}$–$40^{1/7}$] ($39^{0/7}$)	$39^{6/7}$ [$39^{0/7}$–$40^{5/7}$] ($39^{6/7}$)	< 0.001	
Induction of labor	3 (6.0)	57 (10.4)	0.32	
Mode of delivery			0.85	
Cesarean	14 (28.0%)	147 (26.8%)		
Vaginal	36 (72.0%)	400 (73.2%)		
Elective cesarean for breech presentation	9 (18.0%)	101(18.4%)	0.94	
Intrapartum cesarean delivery	5 (10.0%)	46 (8.4%)	0.69	
Neonatal outcomes				
Preterm delivery (< 37 weeks)	4 (8.0%)	0 (0%)	< 0.001	96.70 (5.28–1771.08)
Early term delivery (37–39 weeks)	18 (36.0%)	125 (22.8%)	0.03	1.57 (1.05–2.35)
Birth weight, g	3185 [2955–3378] (3156)	3210 [2970–3600] (3280)	0.07	
Low birth weight (< 2500 g)	5 (10.0%)	17 (3.11%)	0.01	
Apgar 1 min ≤ 7	1 (2.0%)	14 (2.5%)	0.80	
Apgar 5 min ≤ 8	2 (4.0%)	3 (0.5%)	0.007	
Nuchal cord evident at delivery	3 (6.0%)	30 (5.4%)	0.85	
Complications[c]	0 (0%)	5 (1.0%)	0.92	
Reversion[a]	0 (0%)	4 (1.0%)	0.54	
Spontaneous version[b]	1 (7.1%)	4 (2.5%)	0.32	
Low tolerance during ECV	0 (0%)	8 (1.5%)	0.39	

Continuous variables are expressed as median [interquartile range] (mean)

ECV external cephalic version

[a]Denominator for reversion are successful ECVs

[b]Denominator for spontaneous versions are failure ECVs

[c]Complications are defined as any of the following: Post procedure contractions, entering an observation, Placental abruption evident postpartum by placental examination, Nuchal cord ≥ 3

Discussion

There is abundant evidence addressing the factors associated with ECV success [26–35], nevertheless, the comparison of preterm ECV versus term ECV is somewhat underreported in recent years. With successfully performed ECV, women may avoid cesarean delivery or a breech vaginal delivery attempt, both of which require highly skilled operators and adequate facilities [31]. The current paper presents the outcomes of nearly 600 consecutive ECV procedures performed during a 6-year period by a single operator (R.N.P) in women carrying a non-cephalic presenting fetus. Preterm ECV was associated with higher rates of preterm delivery, lower gestational age at delivery and higher proportion of Apgar score at 5 min ≤ 8.

Timing of ECV is a matter of great debate and is crucial for patient counseling and management of non-cephalic presentations near term [8, 18, 36]. The general approach to-date is that preterm ECV may have some benefit in terms of decreasing the rate of non-cephalic presentation; however, it may also increase risk of late preterm birth [18, 37], as also demonstrated in the current cohort. As such, there is a need for careful discussion with women about the timing of the ECV and acknowledge them regarding the potential risk for preterm delivery so that they can make properly informed decisions.

Success rates for ECV reported in the literature vary from 40–50% [14] with some authors reporting rates of up to 86% [38, 39]. Success rates in our study (71.5–72.0%.) did not differ between preterm and term ECV and were in the higher range of that reported in the literature. A recent study compared preterm ECV to term ECV among nulliparous [24] only. The aforementioned study concluded that early initiation of ECV among nulliparous women increased the chance

of immediate cephalic presentation, although not statistically significant (72.2% vs. 66.0%).

The main strengths of our report are the prospective data collection of a 6-year single operator experience and the large study cohort of women undergoing ECV. Nevertheless, several limitations should be underlined. The retrospective analysis of prospectively collected data could expose the study to inherent biases such as information bias and misclassification and selection bias as the decision regarding timing of ECV was based on the discretion of the treating physician with no randomization performed; however, as shown, baseline characteristics did not differ in the group of preterm ECV as compared to term ECV. Moreover, we could not exclude the possibility that other unknown factors could account for the study findings (e.g. history of preterm births, GBS status, characteristics of patients not eligible for ECV procedure).

In conclusion, the present study found that initiating ECV before term is associated with increased rate of preterm delivery, early term delivery and low birth weight, lower gestational age at delivery and 5-minutes Apgar scores. Other outcomes such as mode of delivery, intrapartum cesarean delivery, reversion and spontaneous version – did not differ. We therefore advocate against preterm ECV until proper up-to-date randomized controlled trials will better delineate the effect of preterm ECV on maternal and neonatal outcomes.

Author contributions All authors contributed to the manuscript. GL and AR reviewed the literature and wrote the paper. YW and RNP treated the patients.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval For this type of study formal consent is not required and was waived by the institutional review board approval. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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