

Predictors of successful outcomes after external cephalic version in singleton term breech pregnancies: a nine-year historical cohort study

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Objective To study the success rate, predictors for success, and pregnancy outcomes after external cephalic version.

Design Historical cohort study.

Setting Regional hospital, Hong Kong.

Patients All women who had singleton term breech pregnancies at term and opted for external cephalic version during 2001 and 2009. Their demographic data, clinical and ultrasound findings, procedure details, complications, and delivery outcomes were analysed.

Main outcome measures Predictive factors for successful external cephalic version.

Results A total of 209 external cephalic versions were performed during the 9-year period. The success rate was 63% (75% for multiparous and 53% for nulliparous women). There was no significant complication. On univariate analysis, predictors of successful external cephalic version were: multiparity, unengaged presenting part, higher amniotic fluid index (≥ 10 cm), thin abdominal wall, low uterine tone, and easily palpable fetal head (subjective assessment by practitioners before external cephalic version). On multivariate analysis, only multiparity, non-engagement of the fetal buttock and thin maternal abdomen were associated with successful external cephalic version. In all, 69% of those who had successful external cephalic version succeeded in the first roll ($P < 0.001$), and 82% of the women with successful external cephalic versions had vaginal deliveries (93% in multiparous and 69% in nulliparous women). Uptake rate of external cephalic version was studied in the latter part of the study period (2006-2009). Whilst 735 women were eligible for external cephalic version, 131 women chose to have the procedure resulting in an uptake rate of 18%.

Conclusion External cephalic version was effective in reducing breech presentations at term and corresponding caesarean section rates, but the uptake rate was low. Further work should address the barriers to the low acceptance of external cephalic version. The results of this study could encourage women to opt for external cephalic version.

Key words

Breech presentation; Caesarean section; Version, fetal

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New knowledge added by this study

- External cephalic version (ECV) performed by resident trainees under direct supervision resulted in similar success rate.
- Around 70% of women who had successful ECVs did so in the first roll.
- The estimated uptake rate of ECV (studied late in the study period) was low, at around 18%.

Implications for clinical practice or policy

- Patients achieving safe, successful ECV in their first roll may help/counsel others who worry about the discomfort and duration of the procedure.
- In view of the low success rate in the second somersault, fetal acoustic stimulation which may increase the ECV success rate especially in midline fetal spine positions could be considered.
- ECV is effective in reducing term breech presentations and caesarean sections, but the procedure uptake rate is low and needs to be improved.

單胎妊娠足月產婦成功進行外倒轉胎頭術的預測因子：九年歷史隊列研究

- 目的** 外倒轉胎頭術的成功率、預測成功的因子和妊娠結果。
- 設計** 歷史隊列研究。
- 安排** 香港一所分區醫院。
- 患者** 2001年至2009年期間所有單胎妊娠足月及臀位分娩而選擇進行外倒轉胎頭術的產婦。分析其人口學數據、臨床及超聲結果、手術資料、併發和妊娠結果。
- 主要結果測量** 成功進行外倒轉胎頭術的預測因子。
- 結果** 九年內共進行了209宗外倒轉胎頭術，成功率為63%（多產婦女75%、未產婦女53%），並未發現有嚴重併發病例。單元回歸分析顯示以下因素均為成功進行外倒轉胎頭術的預測因子：多產、臀位未入骨盆、高羊水指數（10厘米或以上）、腹壁薄、宮縮頻率低、較容易摸到胎頭（依靠醫生進行手術前的主觀判斷）。多元回歸分析則顯示只有以下三項與成功進行外倒轉胎頭術有關：多產、胎兒臀部並未進入骨盆、以及產婦腹壁薄。69%成功者於首次外倒轉胎頭術已成功（ $P < 0.001$ ）；另82%成功者最終經陰道分娩（多產婦女93%、未產婦女69%）。我們於研究後期2006至2009年期間，找出選擇進行外倒轉胎頭術的產婦比率。發現在735名產婦中，131名選擇進行此手術，比例為18%。
- 結論** 縱使外倒轉胎頭術可以有效減少足月產婦臀位分娩的情況，以及因此隨之而來的剖腹生產率，可是對於此技術，接受程度偏低。須進行更多研究來找出產婦不接受外倒轉胎頭術的原因。本研究結果應該可以讓產婦更有信心接受外倒轉胎頭術。

Introduction

Breech presentation is the most commonly encountered malpresentation, accounting for 3 to 4% of births at term. Moreover, irrespective of mode of delivery, nearly 20% of term breech babies had a degree of handicap when followed up to 4 to 5 years of age,¹ performing less well on tests of balance, fine motor coordination, visual acuity, and stereopsis vertex position presenters. There have been suggestions that this poorer long-term outcome may be antenatal in origin, as breech babies also exhibit intrauterine behavioural differences compared to their cephalic counterparts.² On the contrary, the risk of cerebral palsy among term breech presentation infants does not seem to be related to mode of delivery, but is more likely linked to their having a higher rate of being small for gestational age.³

After the Term Breech Trial published in 2000⁴ showing lower serious perinatal mortality and neonatal morbidity after planned caesarean delivery for singleton term fetuses, the rate of vaginal breech

deliveries has declined substantially. Current advice for women with term breech pregnancies is to have external cephalic version (ECV), to manipulate the presentation from non-cephalic to cephalic through the maternal abdomen.⁵ Such ECV appears to be safe and effective in reducing the number of elective caesarean sections for breech presentation.⁶ However, its success rate varies between studies from 30 to 80%.⁵ A meta-analysis showed that clinical factors such as multiparity (odds ratio [OR]=2.5; 95% confidence interval [CI], 2.3-2.8), non-engagement of the breech (OR=9.4; 95% CI, 6.3-14), a relaxed uterus (OR=18; 95% CI, 12-29), a palpable fetal head (OR=6.3; 95% CI, 4.3-9.2), and maternal weight of less than 65 kg (OR=1.8; 95% CI, 1.2-2.6) were predictors for successful ECV.⁷ Another meta-analysis showed that ultrasound factors such as posterior placental location (OR=1.9; 95% CI, 1.5-2.4), complete breech position (OR=2.3; 95% CI, 1.9-2.8), and an amniotic fluid index (AFI) of more than 10 cm (OR=1.8; 95% CI, 1.5-2.1) were predictors of successful ECV.⁸

Although ECV reduces the point prevalence of term breech presentation and caesarean section in singleton pregnancies, a meta-analysis showed a higher rate of obstetric intervention for pregnancies with cephalic presentation following ECV than when ECV had not been performed, there being a two-fold increase in caesarean section for successfully turned babies after ECV, which was independent of any increased induction rate.⁹ This is important for patient counselling and may affect women's preferences when choosing ECV.

Since 2001, we introduced a specialist-led ECV session for women with singleton breech presentations at term. This study assessed the success rate of ECV performed in our obstetric unit (in a regional Hong Kong hospital) and examined factors associated with success. Maternal and perinatal outcomes after ECV were also reviewed.

Methods

This historical cohort study was conducted at the Obstetrics Unit of Kwong Wah Hospital, a regional hospital where there are more than 5000 deliveries per year, in the 9 years from January 2001 to December 2009. Women with singleton pregnancies diagnosed at antenatal clinic with breech presentation after 36 weeks of gestation were counselled for ECV by residents (with back-up from specialists), so long as there was no contra-indication according to our departmental protocol.

Women who declined ECV or in whom vaginal delivery was contra-indicated (eg placenta praevia, fibroids obstructing the birth canal, previous obstetric sphincter injuries with faecal incontinence) were offered elective caesarean section. Contra-

indications for ECV also included known uterine scar or anomaly, unexplained third-trimester bleeding, obstetric or medical conditions complicating pregnancy (eg pre-eclampsia, gestational diabetes), compromised fetus (intra-uterine growth restriction, oligohydramnios, macrosomia, polyhydramnios), nuchal cord, fetal anomaly, prelabour ruptured membranes and advanced labour.

Women who accepted ECV were admitted after 37 weeks of gestation on designated days of the week for further assessment and ultrasound examination; 91% of ultrasound examinations and ECVs were performed or supervised by a dedicated specialist obstetrician. Trainees could also assist or perform ECV under direct supervision and guidance, most of whom had been obstetrics and gynaecology residents for 2 to 4 years. As more than 90% of ECVs were performed or supervised by a single specialist, the procedure entailed considerable homogeneity. The woman was transferred to the labour suite where emergency caesarean section can be performed if complications occurred. Blood group matching was done before the procedure. Cardiotocography (CTG) was performed routinely before and after the procedure. All women were given 0.25 mg diluted intravenous terbutaline sulfate (Bricanyl; AstraZeneca, US) or salbutamol sulfate (Ventolin; GlaxoSmithKline, UK, after March 2008) just before ECV. During the procedure, fetal heart, maternal blood pressure and pulse rate were recorded every 2 minutes. Ultrasound was used to monitor the procedure, and repeated after the procedure to confirm its success. More than three somersaults should not be attempted and the duration of each attempt should not exceed 5 minutes. Moreover, the procedure should be abandoned if there is any evidence of fetal distress, maternal discomfort or on request. Anti-D antibody was given prophylactically to all Rhesus-negative women. After the procedure, maternal blood was taken for the Kleihauer test, but not after 2008 when it was eliminated from our protocol. Women were discharged on the same day and an elective caesarean section was arranged for those who failed ECV.

A two-page proforma was designed to obtain information on the demographic characteristics of these women—clinical parameters assessed subjectively before the ECV attempt and included engagement of the presenting part (ease in lifting up the presenting part from the maternal pelvis); maternal abdominal wall features (fat, thin, or unremarkable); uterine tone (assessed after administration of tocolytics); whether the fetal head was easy or difficult to palpate or unremarkable; ultrasound parameters (type of breech, estimated fetal weight [EFW], AFI, fetal and placental position); and procedural details and any complications. The perinatal outcomes of all the pregnancies for which

ECV was attempted were retrieved from hospital electronic record.

Patients for whom ECV was successful had weekly CTGs at follow-up and induction of labour if they went post-term. Labour was closely monitored with continuous fetal heart monitoring in the delivery suite where emergency caesarean sections could be readily arranged if indicated.

Written consent for the procedure was obtained from each woman, as well as approval from our local Cluster Hospital Ethics committee.

Data were entered into a Microsoft Office Excel 2003 spreadsheet. Statistical analysis was performed using the Statistical Package for the Social Sciences (Windows version 16.0; SPSS Inc, Chicago [IL], US). Univariate analyses was performed using Chi squared and Fisher's exact test for frequency data, and Student's *t* test for normally distributed continuous data. Multivariate analyses were performed by binomial logistic regression.

Factors potentially affecting success of ECV were studied using binomial logistic regression. Maternal factors included parity, abdominal wall thickness, and uterine tone. Fetal factors included fetal head engagement, the ease with which it was palpated, and amniotic fluid level. Operator-related factors included the number of somersaults attempted.

During the study, it was noticed that the ECV uptake rate was low. We therefore attempted to estimate the uptake rate after launch of the study. From January 2006 to December 2009, we documented the reasons for cancelling ECV after specialist assessment. We retrieved data on the frequency of breech presentations and contra-indications to ECV from OBSCIS (a database on maternal and neonatal information of all women delivered in our unit) and annual reports generated in our department.

TABLE 1. Characteristics of women with external cephalic version (ECV) attempt (n=209)*

Characteristic	ECV successful	ECV unsuccessful	P value
No. (%)	132 (63%)	77 (37%)	-
Age (years)	30.9 ± 5.2	30.1 ± 4.8	0.272
Body weight (kg)	51.6 ± 7.6	51.2 ± 6.9	0.737
BMI† (kg/m ²)	20.7 ± 2.8	20.4 ± 2.7	0.516
Parity			0.001
Multiparous (n=97)	73 (75%)	24 (25%)	
Nulliparous (n=112)	59 (53%)	53 (47%)	

* Data are shown in No. (%) or mean ± standard deviation

† BMI denotes body mass index, ie maternal weight in kg/maternal height² in m²

TABLE 2. Clinical and ultrasound parameters before external cephalic version (ECV)*

Parameter	No. of women	ECV successful	ECV unsuccessful	P value
Total	209	132 (63%)	77 (37%)	-
Gestational age at ECV (weeks)	208	37.3 ± 0.7	37.2 ± 0.6	0.570
EFW† by ultrasound (kg)	201	2.9 ± 0.3	2.9 ± 0.3	0.257
Amniotic fluid index (cm)	199	13.3 ± 3.6	11.8 ± 3.4	0.004
≤10	58	28 (22%)	30 (42%)	0.003
>10	141	99 (78%)	42 (58%)	
Type of breech	209			0.051
Frank breech	101	57 (43%)	44 (57%)	
Non-frank breech	108	75 (57%)	33 (43%)	
Descent of breech	207			<0.001
Engaged	32	7 (5%)	25 (33%)	
Unengaged	175	125 (95%)	50 (67%)	
Abdominal wall	204			<0.001
Unremarkable	121	68 (52%)	53 (74%)	
Thin	72	60 (46%)	12 (17%)	
Fat	11	4 (3%)	7 (10%)	
Uterine tone‡	204			<0.001
Unremarkable	94	51 (39%)	43 (60%)	
Relax	93	77 (58%)	16 (22%)	
Tense	17	4 (3%)	13 (18%)	
Fetal head	204			0.001
Unremarkable	51	24 (18%)	27 (38%)	
Not palpable	18	9 (7%)	9 (13%)	
Easily palpable	135	99 (75%)	36 (50%)	
No. of somersaults	209			<0.001
Once only	92	91 (69%)	1 (1%)	
>Once	117	41 (31%)	76 (99%)	
Placenta	206			0.236
Anterior	80	46 (35%)	34 (45%)	
Non-anterior	126	84 (65%)	42 (55%)	
Fetal spine	199			0.491
Right lateral	51	37 (29%)	14 (20%)	
Left lateral	97	59 (46%)	38 (54%)	
Anterior	42	28 (22%)	14 (20%)	
Posterior	9	5 (4%)	4 (6%)	
Fetal sex	201			
Female	128	75 (59%)	53 (72%)	0.094
Male	73	52 (41%)	21 (28%)	
Maternal weight (kg)	205			
≤65	197	124 (95%)	73 (99%)	0.264
>65	8	7 (5%)	1 (1%)	

* Data are shown in No. (%) or mean ± standard deviation

† EFW denotes estimated fetal weight

‡ Assessment after tocolytics

Results

Characteristics of women with external cephalic version attempt

During the 9-year period, 209 women had ECVs attempted, 97% of whom were Chinese and 3% were of other South-East Asian ethnicity. The mean (standard deviation [SD]) value for age was 31 (5) years and body mass index (BMI) was 20.6 (2.7) kg/m². Their mean (SD) weight was 51.5 (7.3) kg, and 46% were multiparous. The mean (SD) value for gestational age at ECV was 37.2 (0.7) weeks and mean gestational age at delivery was 39.0 (1.1) weeks. Approximately 49% of women had a frank breech and 49% had complete breech; 2% had footling breech. The mean EFW by ultrasound was 2.9 (0.3) kg and the mean AFI was 12.7 (3.6) cm.

Of the 209 women on whom ECV was attempted, in 132 (63%) it was successful (Table 1); multiparous women had a higher success rate than those who were nulliparous (75% vs 53%, P=0.001). There was no difference between the two groups with respect to success rates in relation to maternal age, body weight, and BMI.

Clinical predictors for successful external cephalic version

In both groups, the mean gestational age at ECV was 37 weeks (Table 2). Predictors for success included: unengaged presenting part, thin abdominal wall, low uterine tone, easily palpable fetal head, and an AFI of greater than 10 cm. After binomial logistic regression, only multiparity (P=0.022), non-engagement of fetal buttock (P=0.009) and thin maternal abdomen (P=0.02) were associated with successful ECV (Table 3). About two-thirds (69%) of the women enjoyed successful ECV in their first roll, while two-thirds (65%) of those in whom more than one somersault was carried out had failed ECV (P<0.001). This pattern of success was noted in nulliparous and multiparous women.

Gestational age at ECV, EFW (by ultrasound), placenta location (anterior or posterior), relationship of fetal spine to maternal spine, maternal body weight of greater than 65 kg, and fetal gender were not shown to predict success of ECV.

Of 209 ECV procedures, 103 were attempted by residents under supervision of a specialist; on average each performed five (range, 1-13) ECVs with a mean success rate of 66% (range, 20-100%).

Maternal and perinatal outcomes with external cephalic version attempt

During the procedure, 77 (37%) of the women who had ECV experienced a mild tachycardia (heart rate >110 beats/min), possibly due to the use of beta-adrenergic tocolytics, whilst three (1%) had transient

hypotension that recovered promptly following fluid resuscitation or spontaneously. In 13 (6%) of the women, a transient fetal heart rate abnormality was shown by CTG after ECV; only one of these women underwent emergency caesarean section owing to a persistent fetal heart abnormality. The baby was born with a birth weight of 2.54 kg and Apgar scores of 6 at the 1st minute and 9 at the 5th minute. The baby was discharged on day 3 with no sequelae. Maternal blood Kleihauer tests were performed before and after ECV until March 2008; 2/154 (1%) of those tested were positive. One result was false-positive because of maternal thalassaemia trait, and another tested positive result after ECV consistent with 1% fetal maternal haemorrhage (although CTG and ultrasound findings remained normal). The latter patient underwent emergency caesarean section on the next day with good maternal and baby outcomes. In all, seven (3%) of the women complained of severe pain during ECV for whom further manipulation was therefore abandoned.

Both the mean gestational age and birth weight at delivery were higher in those who enjoyed

TABLE 3. Odds ratio for successful external cephalic version after binomial logistic regression

	Odds ratio (95% confidence interval)	P value
Engagement of fetal part		
Engaged	1	
Not engaged	8.46 (1.70-42.05)	0.009
Parity		
Nulliparity	1	
Multiparity	3.17 (1.18-8.33)	0.022
Abdominal wall		
Fat	1	
Unremarkable	2.57 (0.41-16.03)	0.31
Thin	11.1 (1.51-81.3)	0.02
Uterine tone		
Tense	1	
Unremarkable	1.23 (0.26-5.76)	0.79
Relax	2.01 (0.384-10.54)	0.41
Fetal head		
Easily palpable	1	
Not palpable	0.462 (0.10-2.21)	0.34
Unremarkable	0.58 (0.19-1.75)	0.33
Amniotic fluid index (cm)		
<10	1	
≥10	2.15 (0.76-6.10)	0.151
No. of somersaults		
Once only	1	
>Once	0.01*	0.996

* 95% confidence interval uncertain because of small sample size

TABLE 4. Maternal and perinatal outcomes after external cephalic version (ECV)*

Outcome	ECV successful (n=130)*	ECV unsuccessful (n=76)*	P value
Mean gestation at delivery (weeks)	39.4 ± 1.1	38.2 ± 0.7	<0.001
Mean birth weight (kg)	3.2 ± 0.4	3.1 ± 0.3	0.012
Presentation at birth†	130	76	
Cephalic	126 (97%)	0	
Breech	3 (2%)	76 (100%)	
Oblique cephalic	1 (0.8%)	0	
Mode of delivery† (total)	130	76	<0.001
Normal vaginal delivery	100 (77%)	1 (1%)	
Instrumental vaginal delivery	7 (5%)	0	
Caesarean section	23 (18%)	75 (99%)	
Mode of birth (nulliparous)	58	52	<0.001
Normal vaginal delivery	34 (59%)	0	
Instrumental vaginal delivery	6 (10%)	0	
Caesarean section	18 (31%)	52 (100%)	
Mode of birth (multiparous)	72	24	<0.001
Normal vaginal delivery	66 (92%)	1 (4%)	
Instrumental vaginal delivery	1 (1%)	0	
Caesarean section	5 (7%)	23 (96%)	
Induction of labour			
Total	47/126 (37%)	-	
Nulliparous	27/55 (49%)	-	0.030
Multiparous	21/71 (30%)	-	

* Data are shown in No. (%) or mean ± standard deviation

† Mode of delivery is missing for three women as they delivered in private sector

successful ECV (Table 4). After successful ECV, four women endured spontaneous reversion to breech (3%) and one had induction of labour and vaginal delivery after the second attempt at ECV was successful.

One woman in whom ECV was unsuccessful had spontaneous onset of labour and gave birth by vaginal breech delivery before arrival at another public hospital.

Women with successful ECVs had a vaginal birth rate of 82% (69% for nulliparous and 93% for multiparous women, P<0.001; Table 4). After successful ECV, induction of labour was resorted to in 49% of nulliparous and 30% of multiparous women (P=0.030). Women undergoing induction of labour had significantly higher caesarean section rate than those who had spontaneous onset of labour (34% vs 4%, P<0.001).

Including those who endured unsuccessful ECV, if women with a singleton pregnancy with breech presentation at term opted for attempt at ECV, nulliparous women had a vaginal delivery rate of 36% and multiparous women a rate of 71%. Without ECV, nowadays in our unit virtually all women underwent

elective caesarean section for term breech presentation. Thus, ECV appeared to have reduced the caesarean section rate in nulliparous women by 36% and by 71% in multiparous women.

External cephalic version uptake rate

We could only estimate the ECV uptake rate in the later part of our study (2006-2009), involving 193 women who attended for ECV assessment though only 113 were attempted; 18 who were willing to have it had spontaneous cephalic version and 14 refused the procedure after admission. In all, 48/80 women initially chose ECV, which was subsequently cancelled due to abnormal ultrasound findings (oligohydramnios, small for gestational fetus, nuchal cords). In all, we had 910 women with singleton breech pregnancies in the period 2006-2009, of whom 127 had contra-indications for ECV (previous uterine scar, placenta praevia). This gave an estimated ECV uptake rate of about 18% (Fig).

Discussion

Our study found that 63% of performed ECVs were

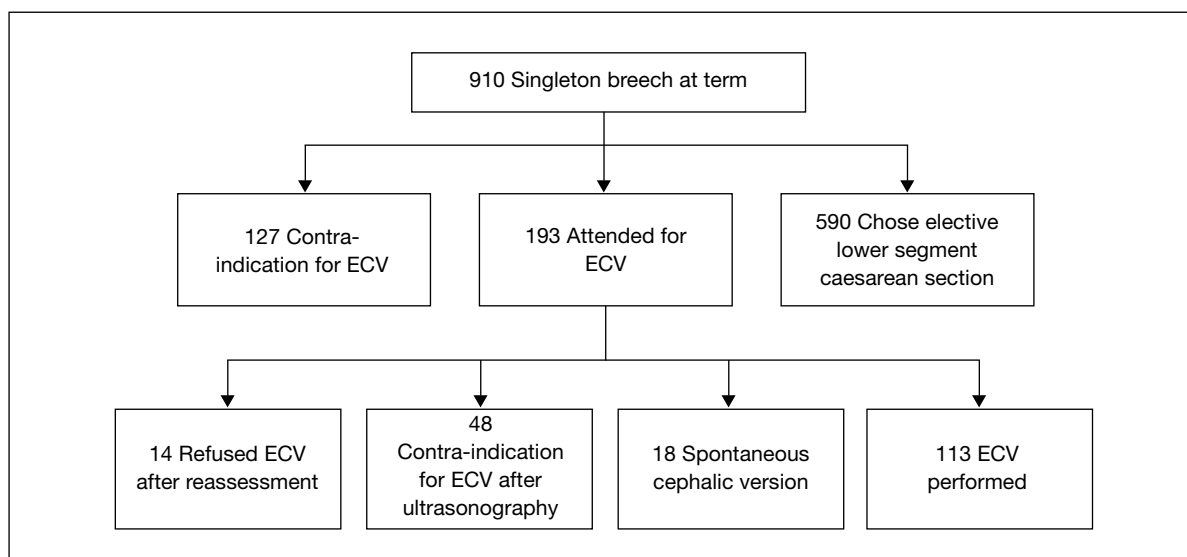


FIG. Women's choice of external cephalic version (ECV) during 2006 to 2009
 Estimated ECV uptake rate = 18% $([193-14-48]/[910-127-48])$

successful, consistent with success rates reported in the literature.¹⁰⁻¹⁴ External cephalic version was associated with a 61% reduction in non-cephalic presentation at birth, similar to that reported in the Cochrane review.⁶

Our study found that on univariate analyses, multiparity, unengaged presenting part, an AFI of more than 10 cm, thin abdominal wall, low uterine tone, and an easily palpable fetal head were predictors of success with ECV, all being consistent with a recent meta-analysis.^{7,8} On multivariate analysis however, only multiparity, non-engagement of a fetal buttock, and thin maternal abdomen were associated with successful ECV. Although the aforementioned meta-analysis included 53 primary articles reporting on 10 149 women, the majority of studies were observational and therefore subject to potential confounders and bias.

The 63% success rate of ECV in this study is comparable to that reported by a local teaching unit (70% in a cohort of 243 women),¹⁵ though in the latter it was not specialist-led. In that study, the two regression models identified three variables as independent predictors of failed versions: (1) presenting part engaged; (2) difficulty palpating the fetal head; and (3) a tense uterus on palpation (assessed after tocolytics). Uterine tone was also reported in another study as the most important predictor of success; all subjects with low uterine tone had successful versions.¹⁰ As in two other studies, all our subjects had received tocolytics before ECV, yet our multivariate analysis failed to show lower uterine tone as a predictor of success. This could be due to different tocolytics regimen (0.25 mg terbutaline subcutaneously in Aisenbrey et al's study¹⁰ and a 10-microgram intravenous bolus

hexaprenaline in Lau et al's study¹⁵). Moreover, these various clinical factors were subjectively assessed by different operators who had different experiences with ECV that could not be clinically quantified. There may nevertheless have been some homogeneity in the present series, as the majority of ECVs were performed or supervised by a single specialist.

Our study confirmed the safety of ECV with only two (1.0%) of the attempts being followed by emergency caesarean sections for a fetal heart rate abnormality and a positive Kleihauer test. In the latter case, caesarean section was performed mainly for the obstetrician's anxiety, and both had good maternal and fetal outcomes. In a review of 44 studies,¹⁶ which included 7377 mothers, transient abnormal fetal heart rate patterns occurred in 6% of cases, and a persistent abnormality in 0.4%. Other complications included: vaginal bleeding (0.5%), placental abruption (0.1%), and emergency caesarean section (0.4%). In a recent meta-analysis,¹⁷ the pooled complication rate was 6% (95% CI, 5-8%), 0.2% for serious complications (95% CI, 0.2-0.3%), and 0.4% for emergency caesarean deliveries (95% CI, 0.3-0.5%). In our department, the quoted figures on the ECV counselling sheet were: transient fetal bradycardia (8%), feto-maternal transfusion (2%), failed procedure (33%), failed vaginal delivery (50%), spontaneous reversion to breech (4%). There was no change in the information sheet over the years of the study. Revisions on the patient information sheet suggested a lower complication rate, together with the higher vaginal delivery rate after ECV, which may encourage more women to undergo the procedure.

In our study, women enjoying successful ECV had a vaginal birth rate of 82% (93% for multiparous women and 69% for nulliparous women). Thus,

the caesarean section rate was down to 18% after successful ECV, which is similar to reports from two other local series (17% and 23%).^{14,18}

In general, if women with singleton breech presentations at term chose to attempt ECV, nulliparous women would have a vaginal delivery rate of 36% and induction of labour of 49%, and in multiparous women the figures were 71% and 30%, respectively. Without ECV, virtually all women would have an elective caesarean section for term breech presentations, while resorting to ECV had reduced the caesarean section rate for breech presentation at term to 64% in nulliparous and 29% in multiparous women. However, we noted that the benefit and impact of ECV on our overall caesarean rate was small because of the low ECV uptake rate in our unit.

As mentioned above, up to 18% of women might have chosen ECV in contrast to findings of a Hong Kong survey¹⁹ published in 2000 (before the era of the Term Breech Trial) in which 82% of pregnant women at their first antenatal visit would choose ECV as the first choice for managing breech presentation. In that survey, only 2% of women considered ECV ineffective, and 13% and 19% considered it not safe for mothers and fetuses, respectively. In fact, data on women's attitudes towards ECV remain sparse. Yogeve et al²⁰ showed a change in women's attitudes (with breech presentation at third trimester) towards breech delivery in 1995 compared to 2001. More women were aware of the option of ECV in 2001 but less were inclined to consider it (54% vs 24%) even before the era of the Term Breech Trial.⁴ Raynes-Greenow et al²¹ showed that equal numbers of women (attending for antenatal care at 20-38 weeks of gestation) would or would not choose ECV (39%), and the remaining 22% were uncertain. Factors influencing their decision included (1) concerns about the safety for the baby, (2) ECV not guaranteeing vaginal birth despite successful version, and (3) ECV not being effective enough. The low uptake rate for ECV in this study could be due to women's refusal at out-patient counselling or to subsequent clinical or ultrasound examinations revealing contra-indications. Our study had limited data to explain such a low uptake rate, though causes have been suggested in literature.²² Interestingly, we found that those enjoying successful ECV usually did so at their first roll (69%, $P < 0.001$). Together with the fact that ECV performed at our unit was safe and effective, this may help the counselling and recruit women for ECV, especially those who worry about the discomfort and duration of the procedure. Practitioners undertaking ECV should also avoid excessive force or somersaulting during the procedure so as to minimise maternal discomfort and anxiety.

In view of the low success rate with the second somersault, we suggest further study to

examine whether fetal acoustic stimulation can increase the success rate. A small study (26 women) suggested that such stimulation in midline fetal spine positions was associated with few failures of ECV at term, though there was not enough evidence to conduct an in-depth evaluation (Cochrane review in 2004).²³

Limitations to the current study included: some missing data on the proforma and few women lost to follow-up as they were delivered in the private sector. Although we had shown that thin abdominal wall and non-engagement of breech were associated with successful ECV, these were subjective assessments and could result in inter- and intra-observer disagreement. The wide CIs for these two putative predictors might also be related to the small number of subjects and inadequate statistical power. Although majority of ECVs were performed by or under supervision by a single specialist, many were assisted or performed by resident trainees, while input from the specialist was difficult to quantify. Therefore, the experience of operators as a factor affecting the success rate of ECV could not be assessed. Moreover, there were wide variations in the number of ECVs performed and its success rate between different residents, both of which could have confounded the effects of the other independent variables. The uptake rate of ECV, which was not the primary objective in this study, was only an estimate from the later part of the study (2006-2009). Women eligible for ECV in these 4 years provided only a rough estimate because women who were lost to follow-up or those who were delivered or managed in the private sector could not be assessed. Potential selection or self-selection bias could not be excluded as detailed documentation of patient's refusal or contra-indication to ECV was not complete. A standardised breech clinic could ensure that women had appropriate counselling about ECV and clearly document patient preferences and any contra-indication to ECV, so as to make a realistic estimate of the uptake rate.

Conclusion

This study showed a high success rate for ECV, even by residents who had little experience, provided it was performed under supervision. While research and effort has aimed at further increasing the success rate, further study is suggested to identify obstacles women face when deciding about ECV, so as to increase its uptake rate. We would like to incorporate the findings from this study into our patient information sheet, since the prospects are more promising than stated before, and hopefully, more women would be encouraged to choose ECV as an alternative means of managing singleton breech pregnancy.

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