Improving management of breech presentation at term
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Mode of delivery and neonatal outcome after external cephalic version: a prospective cohort study

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ABSTRACT

Objective To assess the mode of delivery and adverse neonatal outcome in women with a breech presentation with or without an external cephalic version (ECV) attempt and to compare the mode of delivery among women with successful ECV to women with a spontaneous cephalic presentation.

Design Prospective matched cohort study.

Setting 25 clusters (hospitals and its referring midwifery practices) in the Netherlands. Data of the Dutch perinatal registry for the matched cohort.

Population Singleton pregnancies from January 2011 to August 2012 with a foetus in breech presentation and a delivery from 36 weeks gestation onwards. Spontaneous cephalic presentations (selected from national registry 2009 and 2010) were matched in a 2:1 ratio to cephalic presentations after a successful version attempt. Matching criteria were maternal age, parity, gestational age at delivery and foetal gender.

Main outcome measures Mode of delivery and neonatal outcome.

Results Of 1,613 women eligible for ECV, 1,169 (72.5%) received an ECV attempt, and their caesarean delivery rate was significantly lower compared to women who did not receive an ECV attempt (57% vs 87%; RR 0.66 (0.62 – 0.70)). Women with a cephalic presentation after ECV had, compared to women with a spontaneous cephalic presentation, an increased risk of caesarean delivery (RR 1.7 (95%CI 1.2 - 2.5)), but a decreased risk for instrumental vaginal delivery (RR 0.52 (95% CI 0.29 – 0.94)).

Conclusion Women who had a successful ECV are at increased risk for a caesarean delivery. Despite this fact, ECV is an effective treatment to reduce the caesarean rate.
INTRODUCTION
Breech presentation occurs in 3-4% of all term pregnancies. The Term Breech Trial reported that a planned caesarean delivery reduced the risk of foetal mortality and morbidity as compared to a planned vaginal breech delivery. However, a planned caesarean delivery is associated with an increased risk of maternal morbidity and maternal and foetal complications in subsequent pregnancies.

External cephalic version (ECV) is proven to be effective in prevention of breech presentation, as seven randomised controlled trials indicated a reduction in caesarean delivery rate from 78% to 37%. However, there is increasing evidence that women with a foetus in cephalic presentation after ECV have an increased risk of an emergency caesarean delivery, which can potentially lower the effectiveness of ECV. A recent review by de Hundt et al. on mode of delivery after successful ECV showed a twofold risk of overall caesarean delivery compared to spontaneous cephalic presentations at birth (20.7 vs. 10.9%, pooled OR 2.2 (95%CI 1.7 to 2.8)). However, this evidence came from several rather smaller cohort studies reporting on a total of 1,547 women who delivered after a successful ECV. The review of de Hundt did not focus on neonatal outcome.

The objective of this study was therefore to evaluate the mode of delivery and adverse neonatal outcomes in women with and without an ECV attempt in a large Dutch cohort study and compare the mode of delivery and adverse neonatal outcome to spontaneous cephalic presentations at birth in the Netherlands.

METHODS

Setting
For this study we used data from women included in a cluster randomized controlled trial (RCT) in the Netherlands in which the effect of two ECV implementation strategies to improve the implementation of ECV were evaluated. This cluster RCT was performed in 25 hospitals and the referring midwife practices liaised with these hospitals.

Participants
The trial was performed between January 2011 and August 2012. We collected data from consecutive women with a singleton foetus in breech presentation from 34 weeks gestation and birth from 36 weeks gestation onwards.
Exclusion criteria were women with a contraindication for ECV according to national guidelines, spontaneous version before counselling for ECV, indication for primary caesarean section other than breach presentation, first diagnosis of breach presentation at onset of birth, major congenital malformations related to poor neonatal outcome (e.g. hydrocephalus, spina bifida, cardiac malformations, trisomy 13, 18, 21), and delivery before 36 weeks gestation (as national guidelines recommend ECV from 36 weeks onwards). We documented baseline characteristics including maternal age, parity and gestational age at delivery.

**Matched cohort**
From the cohort mentioned above, we selected all women with a cephalic presentation at birth after successful ECV. We matched each woman with a cephalic presentation after ECV with two women with spontaneous presentations from the Dutch perinatal registry from January 2009 to December 2010. Matching was based on antenatal detectable risk factors associated with an increased risk of emergency caesarean delivery. The risk factors available from both databases were maternal age, parity, gestational age at delivery and foetal gender.

**Outcome measures**
The primary outcome was mode of delivery. We calculated the difference in mode of delivery (overall, planned and emergency caesarean delivery rates) among women with and without an ECV attempt. Secondary outcomes were complications of ECV and neonatal outcome after birth (Apgar score, arterial pH value, admission to neonatal care, perinatal death up to 28 days).
We compared mode of delivery of women after a successful ECV attempt to the mode of delivery (instrumental vaginal delivery, and overall, planned and emergency caesarean delivery rates) of women with a spontaneous cephalic presentation at birth.

**Statistical analysis**
To analyse the data for ECV and mode of delivery, we calculated crude and adjusted relative risks. For the adjusted relative risks, we took the significant difference in mode of delivery between nulliparous and multiparous women (p< 0.001) into account. We also used logistic multilevel analyses, adjusting for possible clustering of observations. The included levels were patient and hospital. Analysis was carried out in SPSS 20.0. P-values were calculated with
double sided independent – samples T-Test for continues data and the χ2 test for binominal data. A p-value of less than 0.05 for a two-tailed test was considered statistically significant.

**RESULTS**

We identified 1,793 women with a breech presentation from 34 weeks onwards (figure 1). We excluded 180 women (10.0%): 72 (4.0%) for reasons of an absolute contraindication for ECV, 46 (2.6%) had an indication for a planned CS other than breech presentation and 62 (3.5%) breech presentations were not diagnosed until birth (figure 1). Of the 1,613 eligible women, 1,169 (72.5%) underwent an ECV attempt with a success rate of 38.7%. ECV was more successful in multiparous than in nulliparous (56% versus 24%, p<0.001). Baseline characteristics are shown in Table 1. There was no difference in age among women who underwent ECV (30.8 vs. 31.2 years (p=0.13)). Mean gestational age at delivery was 39 3/7 weeks (36 0/7 – 42 2/7) if ECV was applied and 38 6/7 days (36 0/7 – 42 1/7) if ECV was not applied (Table 1). Of the nulliparous women 73% underwent ECV compared to 74% of multiparous women (p=0.74).

**Figure 1. Flow chart eligible patients**
Table 1 baseline characteristics

<table>
<thead>
<tr>
<th></th>
<th>Breech presentation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No ECV attempt</td>
<td>ECV attempt</td>
</tr>
<tr>
<td>N = 444</td>
<td>N = 1169</td>
<td></td>
</tr>
<tr>
<td>Age (years) (mean, SD)</td>
<td>31.2 (4.9)</td>
<td>30.8 (4.7)</td>
</tr>
<tr>
<td>Parity (%)</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>Nulliparous</td>
<td>224 (59.9)</td>
<td>616 (58.9)</td>
</tr>
<tr>
<td>Multiparous</td>
<td>150 (40.1)</td>
<td>430 (41.1)</td>
</tr>
<tr>
<td>Gestational age at delivery (weeks, range)</td>
<td>38 6/7</td>
<td>39 3/7</td>
</tr>
<tr>
<td>(weeks, range)</td>
<td>(36 0/7 – 42 2/7)</td>
<td>(36 0/7 – 42 2/7)</td>
</tr>
</tbody>
</table>

Missing values on age n= 61, parity n = 193, gestational age n= 157.

Mode of delivery
Women who had ECV had significantly more cephalic presentations at birth than women who did not have ECV (34.7% vs 7.3%, aRR 5.0 (95%CI 3.2-8.0)), and both the overall CS rate (57.3% vs 84.3% (aRR 0.26 (95%CI 0.17-0.40))) and the planned CS rate were reduced (43.1% to 75.3% (aRR 0.26 (95%CI 0.18-0.38))). The emergency CS rate among women with a trial of labour was also reduced (24.9% to 36.3%, aRR 0.69 (95%CI 0.36-1.3)) (Table 2).
<table>
<thead>
<tr>
<th></th>
<th>No ECV attempt</th>
<th>ECV attempt</th>
<th>Unadjusted Relative risk (95% CI)</th>
<th>Adjusted Relative risk (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 413*</td>
<td>N = 1058*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalic presentation at birth</td>
<td>308 (74.6)</td>
<td>367 (34.7)</td>
<td>4.8 (3.6 – 6.8)</td>
<td>5.0 (3.2-8.0)</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall CS (%)</td>
<td>348 (84.3)</td>
<td>606 (57.3)</td>
<td>0.68 (0.64 – 0.73)</td>
<td>0.26 (0.17-0.40)</td>
</tr>
<tr>
<td>Planned CS</td>
<td>311 (75.3)</td>
<td>456 (43.1)</td>
<td>0.57 (0.52 – 0.63)</td>
<td>0.26 (0.18-0.38)</td>
</tr>
<tr>
<td>Emergency CS</td>
<td>37 (9.0)</td>
<td>150 (14.2)</td>
<td>0.69 (0.51 – 0.92)^5</td>
<td>0.69 (0.36-1.3)^5</td>
</tr>
<tr>
<td>Neonatal outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apgar score &lt;7 at 1 minute^~</td>
<td>19 (4.6)</td>
<td>73 (6.9)</td>
<td>1.5 (0.92-2.5)</td>
<td>1.3 (0.7-2.3)</td>
</tr>
<tr>
<td>Apgar score &lt;7 at 5 minutes^~</td>
<td>4 (1.0)</td>
<td>16 (1.5)</td>
<td>1.5 (0.53-4.6)</td>
<td>1.3 (0.47-3.9)</td>
</tr>
<tr>
<td>Umbilical artery pH &lt;7.05^~</td>
<td>1 (0.2)</td>
<td>3 (0.3)</td>
<td>1.2 (0.12-11.2)</td>
<td>0.66 (0.06-8.0)</td>
</tr>
<tr>
<td>Umbilical vein pH &lt;7.20 ^</td>
<td>1 (0.2)</td>
<td>6 (0.6)</td>
<td>2.3 (0.28-19.4)</td>
<td>0.36 (0.02-6.4)</td>
</tr>
<tr>
<td>Neonatal admission ^~^</td>
<td>3 (0.5)</td>
<td>17 (1.6)</td>
<td>2.2 (0.654-7.5)</td>
<td>1.6 (0.79-3.3)</td>
</tr>
<tr>
<td>Perinatal death’</td>
<td>0</td>
<td>3 (0.3)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Foetal death</td>
<td>0</td>
<td>2 (0.2)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>0</td>
<td>1 (0.1)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Missing values presentation at birth and mode of delivery N = 142 of 1,613 cases (8.8%), excluded from analyses.

^ adjusted for parity and clustering of observations within included clusters

^5 Relative risks calculated over all women with a trial of labour

^Missing values n = 195 of 1,501 cases (13.0%)

^admission to medium care or neonatal intensive care unit.

‘composite of foetal death, perinatal death and neonatal death
Complications of ECV
There occurred three complications immediately following ECV. Two women had a foetal bradycardia at the start of foetal heart registration after ECV. Both bradycardias recovered rapidly in such a way that an intervention to pursue birth was not necessary. In one woman with a gestational age of 36 2/7 weeks the membranes ruptured during the ECV attempt, after which a primary CS was performed resulting in the birth of a healthy baby. There were two stillbirths (1.8‰) reported in the ECV group versus none in the no-ECV group (Table 2). The stillbirths were diagnosed within 24 hours after ECV and within three days after ECV, respectively. In both cases, autopsy and histological study of the placenta did not reveal a cause of death.

Neonatal outcome at birth
Apgar scores at 1 minute and 5 minutes were available in 88% of the cases (Table 2). There was no significant difference in Apgar score below 7 after one and five minutes in the group with an ECV attempt compared to those without an ECV attempt. There were four cases of an umbilical artery pH below 7.05 and 3 cases with an umbilical vein pH between 7.05 and 7.20, without differences between women with and without an ECV attempt. Neonatal admission to a medium or intensive care unit occurred in 20 cases, without a significant difference between the groups with and without ECV. One neonate out of the ECV group was postpartum diagnosed with an uncommon congenital metabolic disease, causing liver failure and died two months after birth.

Matched cohort
Of the 460 women who had a successful ECV attempt, presentation at birth and mode of delivery was known in 409 women, of which 346 (85%) remained in cephalic presentation until birth. Complete data on maternal age, parity, gestation age at delivery, and foetal gender (matching variables) were available in 301 of 346 cases, and we could match 301 of them. Mode of delivery and neonatal outcomes are presented in Table 3. Overall CS rate was almost doubled (14.6 vs. 8.5% (RR 1.7 (95%CI 1.2 - 2.5)) and the emergency CS rate was higher among women with a cephalic presentation after ECV, though not significant (12.0 vs. 8.5% (RR 1.4 (95% CI 0.94 – 2.1)). There was a twofold decrease in instrumental vaginal delivery for women with a cephalic presentation after ECV compared to spontaneous cephalic presentation (4.7 vs. 8.8% (RR 0.52 (95% CI 0.29 – 0.94)).
The incidence of five minute Apgar below 7 was not statistically significant different and neonatal admission only occurred in the control group (n=3) as did perinatal death (n=1).

### Table 3. Mode of delivery and neonatal outcome matched cohort

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Controls</th>
<th>Relative Risks (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mode of delivery</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spontaneous</td>
<td>243 (80.7)</td>
<td>498 (82.7)</td>
<td>0.98 (0.91 – 1.0)</td>
</tr>
<tr>
<td>Instrumental vaginal delivery</td>
<td>14 (4.7)</td>
<td>53 (8.8)</td>
<td>0.52 (0.29 – 0.94)</td>
</tr>
<tr>
<td>Overall CS (%)</td>
<td>44 (14.6)</td>
<td>51 (8.5)</td>
<td>1.7 (1.2 - 2.5)</td>
</tr>
<tr>
<td>Planned CS</td>
<td>8 (2.6)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Emergency CS</td>
<td>36 (12.0)</td>
<td>51 (8.5)</td>
<td>1.4 (0.94 – 2.1)</td>
</tr>
<tr>
<td><strong>Neonatal outcome</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apgar score &lt;7 at 5 minutes</td>
<td>2 (0.7)</td>
<td>7 (1.2)</td>
<td>0.57 (0.12 – 2.7)</td>
</tr>
<tr>
<td>Neonatal admission</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Perinatal death’</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

‘ composite of foetal death, perinatal death and neonatal death
DISCUSSION

To investigate the effect of ECV on mode of delivery, we studied the ECV rate and mode of delivery in 1,613 women eligible for ECV. Our study has shown that an ECV attempt, with a mean success rate of 38.7%, significantly reduces the number of overall caesarean deliveries and planned caesarean deliveries. However, women with a foetus in cephalic presentation after ECV are at increased risk of an emergency caesarean delivery compared to women with a spontaneous cephalic presentation.

To our knowledge, this is the largest cohort on ECV and mode of delivery thus far. Our findings are in line with the Cochrane review of seven randomised controlled trials, representing in total 1,245 women with a breech presentation at or near term regarding the benefits of ECV without major neonatal risks. Furthermore, with a mean ECV success rate of 39% the results of this study are also in line with a cost effectiveness study on ECV, stating that from society’s perspective, ECV trial is cost-effective when compared to a scheduled caesarean for breech presentation provided the probability of successful ECV is more than 32%.

A limitation of this study is that we did not collect data on adverse maternal outcome. Complication rates of CS reported in literature vary from 11.6 to 29% including mild complications as cystitis to severe complications as reoperation and even greater topics of concern are the long term complications of a caesarean delivery, namely the maternal and foetal morbidity and mortality during subsequent pregnancies. Risk of maternal and foetal death during vaginal birth after caesarean delivery (VBAC) is 0.04‰ and 1.3‰ respectively, and during elective repeat caesarean delivery (ERCD) 0.13‰ and 0.5‰ respectively. Thus, data on maternal outcome would strengthen the current results as prevention of caesarean delivery improves maternal outcome and outcome of future offspring which is in line with the recommendation to perform ECV.

A limitation of our matched cohort was that we could only match for four antenatal variables related to increased risk of emergency caesarean section (maternal age, parity, gestation age at delivery, and foetal gender). A clinical prediction model on operative vaginal delivery or caesarean delivery by Schuit et al. demonstrated that age, parity, caesarean delivery in history, diabetes, gestational age at delivery, foetal gender, estimated foetal weight and induction of labour are good predictors for the risk on operative vaginal delivery or caesarean delivery. Better adjustment for other risk factors related to caesarean section rates, might
result in different relative risk ratios for cephalic presentation after ECV. The results of our matched cohort are for so far the overall caesarean rates concerned in line with the most recent systematic review on the subject but not in line with the instrumental deliveries. Our match showed a smaller risk on an instrumental delivery as compared to spontaneous cephalic presentations. In addition to the data presented in the review, we were able to analyse the risk at an emergency caesarean delivery. We did not find a significant difference. The planned caesarean section rate of 62% is in line with a large Dutch cohort study on mode of delivery for term breech presentation after publication of the results of the Term Breech Trial, but is much lower than elective caesarean rates in other countries. An interesting finding is the fact that women who did not have an ECV opted for an elective CS in 80% of the cases. Whether this had to do with the perception that a CS would be safer than an ECV or the breech presentation was an opportunity to opt for an elective caesarean delivery remains unclear. The foetal death rate of 1.8‰ within the ECV group is higher than the 0.9‰ (12 / 12,955) reported in the systematic review on ECV related risks by Grootscholten et al. However, it corresponds to our national foetal death rate of singleton pregnancies after 37 weeks gestation (1.6‰ in 2012), indicating no increased risk from ECV.

CONCLUSION

In conclusion, after successful ECV, women are at decreased risk of an instrumental vaginal delivery and at increased risk of caesarean delivery compared to women with a spontaneous cephalic presentation. Nevertheless, our data confirm that ECV is a key tool to reduce the overall, planned and emergency caesarean delivery rate due to breech presentation at term without increasing neonatal risks.
REFERENCES


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