A retrospective study of the success, safety and effectiveness of external cephalic version without tocolysis in a specialised midwifery centre in the Netherlands

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Abstract

Background
To evaluate the effectiveness of external cephalic version (ECV) without tocolysis or epidural analgesia, the complications associated with the procedure and the association between the number of ECV attempts and cephalic presentation at birth and caesarean section.

Methods
Retrospective cohort study of all (n = 924) ECVs carried out between 1996 and 2000 in a specialised midwifery centre in the Netherlands. After bivariate analysis, those variables with a p value under 0.05 were considered statistically significant and were tested in a logistic regression model using backward stepwise selection. Analyses were carried out separately for first ECV attempts and second ECV attempts.

Findings
In total, 958 ECVs were analysed, 889 first attempts and 69 repeat attempts. Seventy per cent of all first ECVs were carried out before 37 weeks, but half of those were carried out between 36 and 37 weeks. The success rate for first ECV was 41% and for the second ECV 29%. Bivariate analysis showed that the success of the first ECV was positively influenced by parity, non-Dutch origin, higher birth weight, higher age and longer duration of pregnancy. After logistic regression, parity (odds ratio [OR] 2.8, 95% CI 2.1 to 3.7), non-Dutch origin (OR 1.8, 95% CI 1.2 to 2.8) and birth weight (OR 1.7, 95% CI 1.4 to 2.0) remained factors that independently influenced the success of ECV. The odds ratio for duration of pregnancy at first ECV was borderline significant: OR 1.2 (1.0 to 1.4). After an unsuccessful first ECV, only 13% of the women received a second ECV. The prevalence of cephalic presentation at birth increased with 3% after a second ECV. Three cases of complications were reported during or very shortly after the first ECV, and these did not result in serious complications. No complications were reported after a second ECV.

Conclusion
ECV without tocolysis is a safe procedure for pregnant women and their babies. Repeat ECV increases the number of cephalic presentations at birth and should be considered after an unsuccessful ECV. & 2006 Elsevier Ltd. All rights reserved.

Keywords
Cephalic version; Success; Safety; Breech; ECV; External cephalic version
Introduction

The obstetric system in the Netherlands is unique in its focus on physiological childbirth. Historically, vaginal breech birth has always been considered a reasonable and safe option. This policy resulted in a relatively low number of caesarean sections for breech presentation in the Netherlands compared with other Western countries (1). However, the number of caesarean sections for breech presentation began slowly to increase in the second half of the 1990s, from 42% in 1996 to 50% in 2000 (2). After the publication of the Term Breech Trial at the end of 2000 (3), the percentage of caesarean sections for breech presentation increased substantially to 80%. The primary caesarean section rate for breech presentation doubled during the same period from 30–60% (4). The choice for caesarean section in case of breech presentation is rapidly becoming standard policy in the Netherlands, and is used as a means of preventing the neonatal mortality and morbidity shown to be a consequence of vaginal breech birth.

Reducing the number of breech presentations at birth lowers the risks associated with vaginal breech birth. External cephalic version (ECV) has been shown to be effective as a preventive measure for reducing the number of breech presentations at birth, as well as the number of caesarean sections because of breech presentation (5). This procedure was once widely accepted and used in obstetrics and midwifery, but lost its popularity among both obstetricians and midwives around the mid 1970s, primarily because of concerns about the safety of the procedure (6;7). Since the publication of the Term Breech Trial (3), there has been growing interest in (re)introducing this procedure into practice (8-10). The Royal College of Obstetricians and Gynaecologists recommends that a skilled service for external version should be available and offered for breech presentation at term (11).

The effectiveness of ECV is influenced by various factors. Studies show that maternal and fetal characteristics, such as parity, type of breech presentation, uterine contractility, duration of pregnancy, breech position, ease in palpation of fetal head, uterine contractibility, liquor volume, skills of practitioner and placental position may contribute to the success of ECV (12-15). The use of tocolysis, epidural anaesthesia and fetal acoustic stimulation may positively influence the success percentage of ECV (16-17).

However, the issue of the safety of ECV has also been addressed. Complications associated with ECV include uterine rupture, placental abruption, early onset of contractions, premature rupture of membranes, umbilical cord complications, fetal–maternal transfusion, vaginal blood loss, Rhesus antagonism, fetal heart rate pathology, stillbirth and asphyxia (18-24). The most common of these complications is transient
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fetal bradycardia not associated with fetal morbidity (25).
A meta-analysis showed no difference in neonatal morbidity (Apgar score under 7 at 5 mins, low pH in umbilical vein) and mortality between the ECV groups and those not having ECV (17).

A recent systematic review of version-related risks, analysing 44 studies covering a total of 7377 women, showed no increase in fetal mortality or serious morbidity after cephalic version. However, variable patterns in fetal heart rate as seen in electronic fetal monitoring (EFM) (i.e. transient bradycardia or decelerations in the fetal heart rate) frequently occurred, but rarely led to caesarean section (26).

Most studies describe the effects and risks of ECV performed with the use of tocolysis. In the Netherlands, the use of tocolysis or anaesthesia is not standard practice. In about 50% of the hospitals in which ECV is carried out, no tocolytics are used (10). Furthermore, ECVs are also carried out by midwives in primary-care settings, and midwives in the Netherlands are not regulated to prescribe tocolytic or anaesthetic medication. The Dutch guideline for obstetricians on ECV does not contain specific recommendations regarding the use of tocolysis or anaesthesia during ECV (10).

The aim of this study was to gain insight into the success percentage of ECV without the use of tocolysis, and to examine factors associated with a successful ECV. We also looked into the effect of the number of ECV attempts on the number of cephalic presentations at birth and the number of caesarean sections. Finally, we examined complications that may have resulted from the procedure.

This study is unique because of the large amount of data on ECVs carried out without tocolysis. These data can be added to the existing body of evidence addressing the benefits and safety of ECV. We also describe the outcomes of a second ECV without tocolysis, which, as far as we know, has not been addressed before.

Methods

This study was developed as part of the education and research collaboration between the Midwifery School in Amsterdam and the research institute TNO (Institute for Applied Scientific Research) Quality of Life. Eleven final-year midwifery students designed and carried out the study under the supervision of two midwife-researchers (KH, MR).

The ‘Slotervaart’ Hospital (SLVZ), a regional hospital affiliated with the Midwifery School of Amsterdam, has a long tradition of carrying out ECVs during pregnancy. An average of 200 ECVs are carried out each year primarily by one single midwife and, in her absence, by one single obstetrician. Pregnant women with a breech presentation are referred from obstetricians working at the SLVZ and from midwifery practices in
Amsterdam and throughout the country. In 1993, the midwife set up an ECV data registration system for annual review. Students collected data from ECVs carried out between 1996 and 2000 from SLVZ hospital records. Data pertaining to the remainder of the pregnancy and to the birth were collected from the handwritten birth notes and registration forms from 35 different midwifery practices. Approval from a Research Ethics Committee was not required to carry out this study.

Data collected from the ECV register included parity, duration of pregnancy, success of ECV and the use of ultrasound or electronic fetal monitoring before or after the procedure. From midwifery practices, data were collected pertaining to the women (age, ethnicity), the pregnancy (complications and referrals or consultations for complications possibly associated with the ECV), the birth (presentation at birth and mode of delivery) and the baby (neonatal morbidity and mortality).

Analysis was conducted using SPSS (version 11.5). For the bivariate analyses, the Chi square test was used for categorical variables, the student t-test for continuous variables and the Mann–Whitney U test in case of a skewed distribution. Variables with a p value under 0.05 were considered statistically significant and were tested in a logistic regression model using backward stepwise selection. Analyses were undertaken separately for first and second ECV attempts.

Findings

The study population consisted of 924 women referred for ECV in the study period. Thirty-five cases could not be included in the analysis. In 25 of these cases (2.8%), the women did not undergo the procedure because of the following reasons: cephalic presentation at the time of the consultation (n = 21); the baby’s head was positioned behind the placenta (n = 1); or unknown reason (n = 3). In 10 cases (1.1%), no documentation was available about the success of the ECV. In total, 958 ECVs were carried out on; 889 first attempts and 69 repeat attempts. All ECVs were carried out without the use of tocolysis or epidural anaesthesia.

The distribution of baseline characteristics of the study population that may influence the success of ECV are shown in Table 1. Results are shown separately for women who had only one ECV and those who had two ECVs. No significant differences were found between women with one or two ECV attempts.

The results of all first and second ECVs, type of professional who carried out the procedures and the weeks of gestation in which they were carried out are shown in Table 2. The success rate for ECV was 41% (364/889) for first attempts and 29% (20/69) for second attempts. More than two-thirds of the first version attempts were carried
out before term, between 34 and 37 weeks gestation. Ten per cent (7/69) of all second version attempts were after 37 weeks. The chance of success of the first ECV attempt increased with every additional parity and with an increase in birth weight of the baby. The chance of success was more than double for multiparous women (64%; 184/290) compared with nulliparous women (29%; 172/598), and almost double for non-Dutch women (60%; 87/146) compared with Dutch women (38%; 214/561). First attempt ECV was also positively influenced by higher age and longer duration of pregnancy.

After adjustment, parity, non-Dutch origin and birth weight remained factors that independently influenced the success of ECV (Table 3). With every pregnancy, the odds ratio for success of ECV increased almost threefold. Non-Dutch origin and an incremental increase of 500 g birthweight increased the odds ratio for success almost twofold. A 20% increase in success was found with every additional week of pregnancy, but this was borderline significant. Only 13% of women with an unsuccessful ECV received a second ECV. Parity was the only factor contributing to the success of repeat ECV: adjusted OR 4.0 (95% CI 1.4 to 11.3) for every additional parity.

The effects of having at least one ECV on clinically relevant outcomes are shown in Table 4. A successful ECV (either at the first or second attempt) is associated with a large proportion (94%) of women with a baby in cephalic presentation at birth. In 6% of these cases, the baby turned back to breech presentation. The proportion of cephalic presentations at birth increased by 3% after a successful second ECV. A repeat ECV did not result in a significant reduction of the proportion of women undergoing caesarean section, but the numbers involved were small.
### Table 1  Baseline characteristics of women (and their babies) who underwent one or two external cephalic version attempts.*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Women with one ECV attempt (n = 820)</th>
<th>Women with two ECV attempts (n = 69)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nulliparous</td>
<td>552</td>
<td>67</td>
</tr>
<tr>
<td>Multiparous</td>
<td>267</td>
<td>33</td>
</tr>
<tr>
<td>Origin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutch</td>
<td>523</td>
<td>80</td>
</tr>
<tr>
<td>Non-Dutch</td>
<td>133</td>
<td>20</td>
</tr>
<tr>
<td>Age of woman (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>31</td>
<td>(4.5)</td>
</tr>
<tr>
<td>Median</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Birth weight baby (g)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>3394</td>
<td>(476)</td>
</tr>
<tr>
<td>Median</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>Baby’s gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>356</td>
<td>46</td>
</tr>
<tr>
<td>Female</td>
<td>423</td>
<td>54</td>
</tr>
</tbody>
</table>

*Denominators differ due to missing data. ECV, external cephalic version.

### Table 2  Characteristics of the external cephalic version.*

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>First ECV attempts (n = 889)</th>
<th>Second attempt ECV (n = 69)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n %</td>
<td>n %</td>
</tr>
<tr>
<td>Total</td>
<td>364</td>
<td>41</td>
</tr>
<tr>
<td>Successful</td>
<td>41</td>
<td>20</td>
</tr>
<tr>
<td>Not successful</td>
<td>325</td>
<td>21</td>
</tr>
<tr>
<td>Duration of pregnancy at diagnosis of breech</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>31 (3.6)</td>
<td>31 (3.6)</td>
</tr>
<tr>
<td>Median</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Duration of pregnancy at time of first ECV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32-33 completed weeks</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>34-36 completed weeks</td>
<td>613</td>
<td>69</td>
</tr>
<tr>
<td>37 weeks and more</td>
<td>266</td>
<td>30</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>36 (1.1)</td>
<td>37 (1.2)</td>
</tr>
<tr>
<td>Median</td>
<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>

*Denominators differ due to missing data; ECV, external cephalic version.
In all the ECVs, the fetal heart rate was checked with a hand-held Doppler before and after the procedure. An abnormality in the fetal heart rate was found in 21 cases (2.2%), most of which were cases of transient bradycardia (Table 5). In most of these cases, continuous electronic-fetal monitoring was used for further investigation.

Three complications were reported that occurred during or very shortly after the first ECV had been attempted (Table 5). There was one case of ruptured membranes during the ECV, resulting in a spontaneous vaginal breech birth of a healthy baby. One woman was admitted to hospital for abdominal pain on the same day she had undergone ECV. A few hours after admission, she underwent an emergency caesarean section because of...

**Table 3** Logistic regression using backward stepwise selection with crude and adjusted odds ratios for factors that may influence the success of a first external cephalic version attempt.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Outcome of first ECV attempts (n = 889)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Successful ECV (%) or (mean)</td>
<td>Unsuccessful ECV (%) or (mean)</td>
</tr>
<tr>
<td>Origin</td>
<td>Dutch (n = 561)</td>
<td>38.1</td>
</tr>
<tr>
<td></td>
<td>Non-Dutch (n = 146)</td>
<td>59.6</td>
</tr>
<tr>
<td>Baby’s gender</td>
<td>Male (n = 394)</td>
<td>40.6</td>
</tr>
<tr>
<td></td>
<td>Female (n = 449)</td>
<td>40.8</td>
</tr>
<tr>
<td>Person carrying out ECV</td>
<td>Obstetrician (n = 126)</td>
<td>35.7</td>
</tr>
<tr>
<td></td>
<td>Midwife (n = 750)</td>
<td>41.9</td>
</tr>
<tr>
<td>Parity</td>
<td>(0.86)</td>
<td>(0.23)</td>
</tr>
<tr>
<td>Age of mother</td>
<td>(31.6)</td>
<td>(30.4)</td>
</tr>
<tr>
<td>Birth weight of baby (lbs)</td>
<td>(7.1)</td>
<td>(6.6)</td>
</tr>
<tr>
<td>Duration of pregnancy at ECV</td>
<td>(36.6)</td>
<td>(36.2)</td>
</tr>
<tr>
<td>Duration of pregnancy at diagnosis of breech</td>
<td>(31.1)</td>
<td>(30.9)</td>
</tr>
</tbody>
</table>

ECV, external cephalic version.

**Table 4** Presentation at birth and method of delivery by success of external cephalic version in first attempt and second attempt external cephalic version during pregnancy.

<table>
<thead>
<tr>
<th>Presentation at birth and mode of delivery</th>
<th>Cephalic (n = 352)</th>
<th>Non-cephalic (n = 474)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vaginal (n = 315)</td>
<td>Caesarean (n = 37)</td>
</tr>
<tr>
<td></td>
<td>Vaginal (n = 280)</td>
<td>Caesarean (n = 194)</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Women with only one ECV attempt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>283</td>
<td>87</td>
</tr>
<tr>
<td>No success</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>Women with two ECV attempts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>15</td>
<td>79</td>
</tr>
<tr>
<td>No success</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Percentages do not add up exactly to 100% due to rounding.
vaginal blood loss and a compromised baby. Although this baby was born in poor condition, it recovered quickly enough to be able to leave the hospital with the mother within a week of birth. One woman had vaginal blood loss and fetal heart rate pathology after ECV, which resulted in an emergency caesarean section for placental abruption and the birth of a healthy baby. No complications were reported after a second attempt at ECV. There were no cases of fetal or maternal mortality.

Discussion

The core data for this study were obtained retrospectively from a database of practice that had not earlier been analysed except for annual reporting purposes. The additional data collected by student midwives enabled the researchers to link the practice of ECV with individual characteristics of the women who underwent the procedure. Although data pertaining to a large cohort of women were collected, the retrospective design must be considered a limitation of the study. Despite this, we feel that this study adds valuable insight into the ECV carried out by a skilled clinician and without tocolysis, as there is little research into this procedure. In addition, conclusions concerning second attempt ECV are inconclusive owing to the small numbers and the selection process used for women receiving a second ECV. We feel, however, that this information can contribute to the discussion on the value of repeat ECV as it addresses repeat ECV without tocolysis, which as far as we know has not been reported before.

The study population consisted of women referred by obstetricians and midwives to a specialised centre for ECV. It is not known how many obstetric caregivers in the Netherlands practice ECV, but it is assumed that this is not common practice. Primary practitioners referred 90% of the women in this study without attempting an ECV themselves. Therefore, it can be assumed that the ECVs undertaken in this study were
not the ‘difficult cases’ that are referred after a failed first attempt. The results of this study, therefore, reflect the effectiveness and safety of ECV when carried out by skilled and experienced practitioners, without tocolysis or epidural anaesthesia.

The variation in success percentage of ECV reported in various studies may be caused by the different methods and techniques used in carrying out ECV (i.e. tocolysis and epidural anaesthesia). The success percentage of first ECV found in this study (41%) is consistent with the findings in the Cochrane review (95) for term ECV carried out without tocolysis. The same was found for the percentage of cephalic presentations at birth after ECV.

A few investigators have looked explicitly at the success of repeat attempts of ECV in the same pregnancy (27-29). They reported success rates ranging from 17–56%. Our study, with a success rate of 29%, may not be comparable to these studies for two reasons. First, the ECVs in our study, including all second attempts, were carried out without any form of tocolysis or anaesthesia, whereas, in other studies the repeat ECVs were carried out with either tocolysis or epidural anaesthesia after first attempts with tocolysis. Second, most studies report the success percentage of second attempt ECV in a selected group of women undergoing the procedure. The selection criteria for second attempt ECV varied in the different studies, which may have influenced the overall success percentage.

In our study, second ECV was not routinely offered to all women after a failed first ECV attempt. According to the midwife who carried out most of the first ECV attempts, women were referred for a second attempt when she estimated the chance of success as being good. This estimate was based on the course of the first ECV and the motivation of the pregnant woman.

More important than the success percentage of second ECV is the effect of repeat ECV on the number of cephalic presentations at birth and the number of caesarean sections. This study shows that the number of cephalic presentations at birth increases by 3% when only a small number of women undergo a second ECV after an unsuccessful first attempt. A further increase in the percentage of cephalic presentations at birth may be expected when a larger group of women are being offered repeat ECV.

In this study, a clinically significant decrease in the percentage of caesarean sections after a successful repeat ECV cannot be deduced. This is not consistent with other studies conducted in the USA and France on the effect of repeat ECV (27-30). The protective effect of repeat ECV may not have been detected in the present study because of the low numbers involved and the comparatively low percentage of caesarean births for breech presentation (41%) during this period in this hospital. In general, the benefits of ECV are shown to be greater when the caesarean birth rate for breech presentation is higher (31). In view of the increase in primary caesarean births for breech presentation
in the Netherlands, it can be expected that future studies will detect a reduction of caesarean births due to repeat ECV. However, the decrease in operative deliveries might be lower than expected owing to a higher incidence of obstetric interventions after successful ECV (30).

The data pertaining to predictive factors for successful ECV collected in this retrospective study were limited. Of the available data, only previous pregnancy, non-Dutch origin and higher birth weight, contributed to the success of the first ECV. Parity was the only factor contributing to the success of repeat ECV. This is consistent with other published studies (12;13;15;30-32). The success of ECV is not only related to physical, obstetric and neonatal factors but may be influenced by other factors such as skill of practitioner and maternal attitude, expectations and stress.

One of the most feared complications related to ECV is placental abruption. In the present study, abruption was diagnosed in one case but may have occurred in a second case where the diagnosis was uncertain (Table 5). Two (possible) abruptions in a total of 958 ECV attempts (0.2%) is comparable with the incidence of abruption in the general population of pregnant women in the Netherlands, which is 0.2% (33) and with the 0.34 in a general term population as described in the systematic review of Collaris and Oei (26). In addition, of the three reported complications relating to ECV, only one resulted in short-term neonatal morbidity.

All cases of neonatal morbidity occurred with a first attempt ECV. It is not known from the published literature whether the risk of complications increases after a second ECV attempt. However, several studies have suggested that a large proportion of severe complications result from the use of tocolysis or anaesthesia leading to a lack of pain signals as a warning that too much force may be applied (26;29). In our study, first and repeat ECV were carried out in a setting without the use of tocolysis or anaesthetics.

In this study, first and second attempt ECV is shown to be a safe and effective procedure for pregnant women and their babies in preventing breech presentations at the onset of labour. Moreover, repeat ECV increases the number of cephalic presentations at birth and should be considered after an unsuccessful first attempt.

Acknowledgement

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