Success Rate and Clinical Outcomes of External Cephalic Version with or without Anesthesia for Breech Presentation at Term in China

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Abstract
Background: To determine whether neuraxial anesthesia (NA) can improve the success rate of external cephalic version (ECV), and evaluate the clinical outcomes. Methods: This study included 201 consecutive participants who had a breech presentation at term and received ECV between 2014 and 2022. Participants who received ECV without NA were included in Group 1, while participants with NA were included in Group 2. Outcomes assessed were the success rate of ECV and clinical outcomes. Results: In total, 201 participants who had a breech presentation at term and received ECV met the inclusion criteria. Totally, 134 participants performed ECV without NA were included in Group 1, while 67 participants performed the ECV with NA were included in Group 2. The success rate of ECV among the participants was 66.2% (133/201). The rate of placental abruption during or after ECV and neonatal intensive care unit (NICU) admission in Group 2 was statistically significant higher than in the Group 1 (p < 0.05). Conclusions: This study suggested that the use of NA did not increase ECV success rates after 37 weeks of gestation. The recommendation of NA for the ECV may not be suitable for all pregnancies unless the participants request. A large and high-quality study should be conducted to verify the role of NA in ECV, if any.

Keywords: external cephalic version; breech presentation; neuraxial anesthesia; cesarean delivery

1. Introduction

The incidence of noncephalic presentation is 3–4% in full-term pregnancies, and the external cephalic version (ECV) is a method of correcting the breech position and is a good method in reducing noncephalic presentation [1]. A high-quality meta-analysis study observed the success rate of procedure ECV was quite different range from 16% to 100% [2]. The huge difference might be due to the participants’ pain and tension which has been theorized to increase abdominal tone and guarding [3]. With restricting the obstetrician’s ability to rotate the fetus, the operators had used many ancillary methods (Moxibustion, Amniocentesis, terbutaline, Calcium Channel Blockers, Analgesia) to relax the maternal uterus and abdominal wall muscles to make the participants feel comfort or painlessness of the procedure [4–7].

Several previous randomized controlled trials (RCT) reported that ECV with neuraxial anesthetic (NA) blockade either the intrathecal or epidural route leads to a higher success rate because of reducing the pain, although the best practice has not been clarified [8,9]. Meanwhile, some publications found a significant difference for pain levels from the surgery between the two groups, but the same success rate [10,11]. However, evidence about the efficacy of analgesia to improve the success of ECV is insufficient and lack of systematic empirical investigation at present, especially in China [12]. We have been performing ECV procedure since the last decade in our hospital, we aimed to determine whether ECV with or without NA affects the success rate of ECV and clinical outcomes.

2. Methods

2.1 Patient Identification

This is a retrospective study followed the Declaration of Helsinki and approved by the Ethics Committee of Ningbo participants and Children’s Hospital (approval number: EC2022-041). Participants who met the inclusion criteria were included in the study, from December 1st 2014 to December 31st 2022.

The inclusion criteria included: (a) singleton pregnancy; (b) a noncephalic presentation at 36–38 weeks gestation and scheduled for ECV.

The exclusion criteria included: (a) cesarean delivery (CD) cannot be avoided, diagnosed with placenta previa or twin pregnancy; (b) contraindications were early labor, oligohydramnios or rupture of membranes, severe fetal growth restriction, uterine malformation, prior abortion and prior cesarean delivery; (c) incomplete history and surgery records were available; and participants requested repeat CD during delivery. Fig. 1 showed the flowchart of
Fig. 1. Flow chart of patient selection.

Singleton breech women between December 2014 and December 2022 (n=251)

Excluded:
- Not meeting inclusion criteria (n=3)
- Rupture of the membranes (n=4)
- Pre-eclampsia (n=2)
- Declined to participate (n=41)

Assessed for eligibility (n=201)

Allocated to Group 1 (n=134)
Allocated to Group 2 (n=67)

The criteria for selecting the participants for NA: participants who were informed of the benefits and disadvantages of ECV under NA, and agreed the anaesthesia. Participants gave consented to before the procedure of ECV and were fasted for 6 hours or more. The position, weight of the fetus and the amniotic fluid index was confirmed by the ultrasonography before ECV. In labor and delivery room, the real-time ultrasound guidance, continuous electronic fetal heart rate monitoring and facilities for emergency cesarean delivery were all immediately available during the procedure of ECV. First, all participants were open intravenous access. After injection of 0.25 mg subcutaneous terbutaline, subarachnoid analgesia was performed via a 26-gauge Gertie Marx Neuraxial needle inserted at the L3-4 interspace with 7.5 mg of intrathecal ropivacaine in the left side lying position. Loss of sensation to pinprick to at least the T10 level was verified success functioning of the Neuraxial opioid. All ECV attempts were performed by the same experienced operators (Dr. Ying or Dr. Chen) who had been working for 20 years. Each obstetrician made no more than five ECV attempts. After the procedure, the participants had continuous electronic fetal heart rate monitoring to assess the fetal heart rate at least for 30 min and remained on the labor and delivery room for at least 2 hours. Participants were allocated to Group 1-ECV without NA and only offered 0.25 mg subcutaneous terbutaline approximately 20 min before the start of ECV. Participants were allocated to Group 2-ECV with NA.

2.2 Data Collection

The prenatal characteristics including maternal age, pregnancy body mass index (BMI), education background, parity (primiparous), gestational age at ECV, estimated birth weight (EFW), anterior placental implantation, amniotic fluid index (AFI), loops of nuchal cord, gestational diabetes mellitus (GDM), and surgeon (Dr. Chen) were collected in the current study. The clinical outcomes collected included successful ECV, vertex presentation at delivery, emergency CD (EmCD), concerning fetal heart rate after ECV, placental abruption after ECV, gestational age at delivery, postpartum hemorrhage (PPH), neonatal weight, Apgar score (5 min, ≤7), and neonatal intensive care unit (NICU) admission. Estimated fetal weight (EFW) was evaluated by the Hadlock formula.

The primary outcome, in this study, included the success rate of ECV and cesarean delivery rates; the secondary outcome included clinical outcomes, such as placenta abruption, cord prolapse, hemorrhage and Apgar score.

2.3 Statistical Analysis

The Mann–Whitney U test was conducted to analyze the differences for continuous variables, and Fisher’s exact test or the Chi-squared test was performed to analyze the differences for categorical variables. Continuous variables were showed as the means ± standard deviation (SD), and categorical variables were showed as the median and
Table 1. Demographic and clinical characteristics of the participants in the two groups.

<table>
<thead>
<tr>
<th>Clinical parameters</th>
<th>Group 1 (n = 134)</th>
<th>Group 2 (n = 67)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age (years),</td>
<td>31.22 ± 4.18</td>
<td>30.04 ± 4.22</td>
<td>0.090</td>
</tr>
<tr>
<td>Prepregnancy BMI (kg/m²)</td>
<td>20.80 ± 2.66</td>
<td>21.55 ± 2.34</td>
<td>0.445</td>
</tr>
<tr>
<td>education background (≥ graduate), n (%)</td>
<td>95 (70.9%)</td>
<td>54 (80.6%)</td>
<td>0.193</td>
</tr>
<tr>
<td>Parity (times)</td>
<td>1 (0–3)</td>
<td>1 (0–3)</td>
<td>0.813</td>
</tr>
<tr>
<td>Primiparous, n (%)</td>
<td>50 (37.3%)</td>
<td>26 (38.1%)</td>
<td></td>
</tr>
<tr>
<td>Gestational age at ECV (weeks)</td>
<td>37⁰/⁰ (37⁰/⁰–39⁰/⁰)</td>
<td>38⁰/⁷ (37⁰/⁷–39⁰/⁷)</td>
<td>0.006</td>
</tr>
<tr>
<td>Estimated birth weight (kg)</td>
<td>3.08 ± 0.30</td>
<td>3.10 ± 0.39</td>
<td>0.741</td>
</tr>
<tr>
<td>Anterior placental implantation, n (%)</td>
<td>56 (41.8%)</td>
<td>24 (35.8%)</td>
<td>0.262</td>
</tr>
<tr>
<td>AFI (mm)</td>
<td>122 ± 35</td>
<td>115 ± 30</td>
<td>0.236</td>
</tr>
<tr>
<td>Loops of nuchal cord (yes), n (%)</td>
<td>88 (65.7%)</td>
<td>46 (68.6%)</td>
<td>0.705</td>
</tr>
<tr>
<td>GDM, n (%)</td>
<td>114 (85.1%)</td>
<td>52 (77.6%)</td>
<td>0.282</td>
</tr>
<tr>
<td>Surgeon (Dr. Chen), n (%)</td>
<td>60 (44.8%)</td>
<td>46 (68.6%)</td>
<td>0.336</td>
</tr>
</tbody>
</table>

Data in the table are presented as n (%), mean ± SD, and median [interquartile range]. ECV, External cephalic version; BMI, body mass index; GDM, gestational diabetes mellitus; AFI, amniotic fluid index.

Table 2. Clinical outcomes of the participants.

<table>
<thead>
<tr>
<th>Clinical outcomes</th>
<th>Group 1 (n = 134)</th>
<th>Group 2 (n = 67)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful ECV, n (%)</td>
<td>90 (67.2%)</td>
<td>44 (65.6%)</td>
<td>0.833</td>
</tr>
<tr>
<td>Vertex presentation at delivery, n (%)</td>
<td>90 (67.2%)</td>
<td>43 (64.2%)</td>
<td>0.675</td>
</tr>
<tr>
<td>Total CD, n (%)</td>
<td>47 (35.1%)</td>
<td>29 (43.3%)</td>
<td>0.260</td>
</tr>
<tr>
<td>EmCD, n (%)</td>
<td>6 (4.5%)</td>
<td>8 (11.9%)</td>
<td>0.050</td>
</tr>
<tr>
<td>Concerning fetal heart rate during ECV, n (%)</td>
<td>6 (4.5%)</td>
<td>7 (10.4%)</td>
<td>0.075</td>
</tr>
<tr>
<td>Placental abruption after ECV, n (%)</td>
<td>0 (0%)</td>
<td>3 (4.5%)</td>
<td>0.013</td>
</tr>
<tr>
<td>Gestational age at delivery (weeks)</td>
<td>39⁰⁰/⁰ (38⁰⁰/⁰–39⁰⁰/⁰)</td>
<td>39³⁷/⁷ (38³⁷/⁷–40³⁰/⁷)</td>
<td>0.982</td>
</tr>
<tr>
<td>PPH, n (%)</td>
<td>4 (3.0%)</td>
<td>6 (9.0%)</td>
<td>0.067</td>
</tr>
<tr>
<td>Neonatal weight, g</td>
<td>3.36 ± 0.33</td>
<td>3.25 ± 0.38</td>
<td>0.055</td>
</tr>
<tr>
<td>Apgar score (5 min, ≤7), n (%)</td>
<td>0 (0%)</td>
<td>1 (1.5%)</td>
<td>0.539</td>
</tr>
<tr>
<td>NICU admission, n (%)</td>
<td>3 (2.2%)</td>
<td>6 (9.0%)</td>
<td>0.030</td>
</tr>
</tbody>
</table>

Data showed as n (%), or mean ± SD, or median [interquartile range], which appropriately. NICU, neonatal intensive care unit.

3. Results

In total, 251 participants who received ECV were included in this study, from December 1st 2014 to December 31st 2022. 54 participants did not meet the inclusion criteria because they received repeat CD at their request. 134 of 201 participants were allocated to Group 1, while 67 participant were allocated to Group 2. We observed overall success rate was 66.2% (133/201) in this study (Fig. 1). Table 1 showed the demographic and clinical characteristics of all participants. No statistically significant differences were observed in age, prepregnancy body mass index, education background, parity, estimated birth weight, anterior placenta, AFI, Loops of nuchal cord, GDM or Surgeon in each group. Gestational age at ECV in Group 2 was higher than in Group 1 (p < 0.01).

Table 2 showed the clinical outcomes of each group. There were no significant differences in successful ECV, vertex presentation at delivery, CD, EmCD, concerning fetal heart rate after ECV, gestational age at delivery, PPH, neonatal weight, or Apgar score between the two groups. The rate of placental abruption during or after ECV and NICU admission was significantly higher in Group 2 than in Group 1 (p < 0.05).

The mode of delivery in the 201 participants is shown in Table 3. In Group 1, 90/134 was successful and all were vertex presentations at delivery. Three participants chose elective CD (EmCD) even if the ECV procedure was successful. In Group 2, 44/67 was successful, 43 were all vertex presentations at delivery. Only one patient was found to have premature rupture of membranes (PROM) and umbilical cord prolapse still with breech presentation even if the ECV procedure was successful. Three participants chose elective CD even if the ECV procedure was successful. Three participants had an EmCD; one was found to have vaginal bleeding combined with placental abruption after ECV, and the other was found to have a concerning fetal heart rate combined with placental abruption after ECV. If found a significantly higher rate of EmCD after successful ECV in Group 2 than in Group 1 (p < 0.05).
Table 3. Mode of delivery in the participants.

<table>
<thead>
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<th>Group 1 (n = 134)</th>
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<tbody>
<tr>
<td>Success ECV, n (%)</td>
<td>90 (67.2%)</td>
<td>44 (65.6%)</td>
<td>0.833</td>
</tr>
<tr>
<td>EICD, n (%)</td>
<td>3 (3.3%)</td>
<td>3 (4.5%)</td>
<td>0.363</td>
</tr>
<tr>
<td>EmCD, n (%)</td>
<td>0 (0%)</td>
<td>3 (4.5%)</td>
<td>0.012</td>
</tr>
<tr>
<td>Failed ECV, n (%)</td>
<td>44 (32.8%)</td>
<td>23 (34.3%)</td>
<td>0.403</td>
</tr>
<tr>
<td>EICD, n (%)</td>
<td>38 (28.6%)</td>
<td>18 (26.9%)</td>
<td></td>
</tr>
<tr>
<td>EmCD, n (%)</td>
<td>6 (13.6%)</td>
<td>5 (21.7%)</td>
<td></td>
</tr>
</tbody>
</table>

EICD, elective cesarean delivery; EmCD, emergency cesarean delivery.

4. Discussion

The primary result of our study is that the success rate of ECV was 66.2% in a Chinese population. In the two groups, no difference was found in the success rate of ECV, but participants in Group 1 had a lower placental abruption and NICU admission after ECV compared to Group 2. Generally, participants without NA are more likely to experience successful ECV, which is safe and feasible for participants and lowers poor outcomes.

Our success rate of ECV without NA was 67.2%, similar to the results in Manal’s report (68.1%, 145/213) [13]. The findings also show that NA cannot improve the rate of successful conversion to cephalic presentation. Dugoff and Birnbach’s studies both showed that the surgery ECV with or without NA did not show a difference in success rate for conversion to cephalic presentation [14,15]. However, many researchers found that participants with NA had a higher success rate due to less maternal pain [16,17]. A few potential explanations for these differences between our results and those of findings are as follows. Our study was not a randomized control trial (RCT). Factors such as surgeon and operating room (OR) procedures may influence the success rate. If we could try an ECV with NA for a second attempt after a failed ECV attempt, the success rate and a reduction of Cesarean delivery could be calculated again. In a study performed by Cobec et al. [18], the CD rate among participants with successful ECV was 19.4%, while in ours it was 6.72%. So, we may attempt to conduct this trial.

One of the serious complication of ECV is placental abruption [19]. The incidence of placental abruption complication among 201 participants who received ECV in the present study was 1.45% (3/201), which was similar with other studies that the rate of placental abruption was from 1.0 to 4.2% [20,21]. Details of these three cases occurred with placental abruption are as follows. The first case was performed successful ECV in a patient with NA. However, after 8 hours of ECV, the patient was diagnosed with PROM and umbilical cord prolapsed. Emergency cesarean section was operated and confirmed Breech presentation. Apgar score at 5 min of the neonate was well (nine points), the same as the umbilical cord artery pH (7.260). The placenta was adherent with a 4-cm clot in cesarean section during the delivery of the placenta. The other two cases occurred during the surgery of ECV found 3 min of fetal bradycardia with NA tested by the continuous electronic fetal heart rate monitoring. Emergency cesarean section was performed due to recurrent late deceleration. Apgar score at 5 min was good (nine points) and umbilical cord artery pH was normal. A 5-cm clot adherent to the placenta was detected. No case of death or severe neonatal morbidity was found.

A univariate analysis in our study revealed that the gestational age at ECV in Group 2 was significantly higher than in Group 1. The gestational age of ECV is typically performed near term in most institutions based on recommendation by obstetricians for fetal lung maturity and neonatal asphyxia resuscitation [22]. Early ECV can have more fetuses in noncephalic presentation at delivery than late ECV; interestingly the rate of cesarean delivery with early ECV was not significantly reduced compared to late ECV [23,24]. Meanwhile, in our study and some cohort studies, greater gestational age at procedure was associated with an increased likelihood of failed ECV [25]. The optimum block (epidural or Neuraxial) and drug dose are yet to be researched. A first attempt could be performed with low-dose NA at a greater gestational age. ECV combined Neuraxial technique could enable prompt Cesarean delivery if needed. In this study, some patients might choose anesthesia, when they with older gestational age require external inversion, because the pregnancy could be terminated by cesarean section without re-anesthesia, if the external inversion is not successful. Meanwhile if general anaesthetic technique is quiet enough, NA is not always needed. However, to draw the most appropriate gestational age at ECV, high-quality randomized clinical trials or more prospective cohort studies with large sample sizes can be conducted in our hospital.

Certainly, several limitations were notable in this study. First of all, it is noteworthy that no poor outcome was found, with regard to participants with ECV success. As this is a retrospective study involving only a small number of cases in one center, the results recorded in the surgical records may be lacking. Second, prospective randomization arrangements regarding NA can be recommended to eliminate the selection bias. Finally, we had no authority to acquire data on several confounding factors, such as psychological factors, family support, and socioeconomic conditions, which might result in deviation from the successful ECV rate, including over- or under-evaluation. Accordingly, caution should be noticed when interpreting the finding due to a number of limitations.

5. Conclusions

In our study, ECV with NA did not increase ECV success rates at term. The recommendation of NA for the ECV may be not suitable for all pregnancies unless the participants request. Large and high-quality cohort or RCT studies should be conducted to confirm our findings.
Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

JY and ZEL—Data Collection, Manuscript Writing; TTL and QND and TTS—Data Collection; HYJ and QW—Data Analysis; XBH—Project Development, Manuscript Editing. All the authors reviewed and approved the final version of the manuscript.

Ethics Approval and Consent to Participate

The Institutional Review Board of Ningbo Women and Children’s approved this study. The need for informed consent was waived by the Institutional Review Board of Ningbo Women and Children’s because of retrospective nature of this study (approval number: EC2022-041). Research was conducted according to the ethical standard of Helsinki declaration and that data of patients were stored anonymized in a dedicated database. All methods were carried out in accordance with relevant guidelines and regulations.

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Conflict of Interest

The authors declare no conflict of interest.

References


