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Chapter 3

Mode of delivery after successful external cephalic version: a systematic review and meta-analysis

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Abstract

OBJECTIVE

To assess the mode of delivery in women after a successful external cephalic version by performing a systematic review and meta-analysis.

DATA SOURCES

We searched MEDLINE, Embase, ClinicalTrials.gov, Cumulative Index to Nursing and Allied Health Literature, and the Cochrane Library for studies reporting on the mode of delivery in women after successful external cephalic version at term and women with a spontaneous cephalic-presenting fetus.

METHODS OF STUDY SELECTION

Two reviewers independently selected studies, extracted data, and assessed study quality. The association between mode of delivery and successful external cephalic version was expressed as a common odds ratio with a 95% confidence interval (CI).

TABULATION, INTEGRATION AND RESULTS

We identified three cohort studies and eight case-control studies, reporting on 46,641 women. The average cesarean delivery rate for women with a successful external cephalic version was 21%. Women after successful external cephalic version were at increased risk for cesarean delivery for dystocia (odds ratio (OR) 2.2, 95% CI 1.6–3.0), cesarean delivery for fetal distress (OR 2.2, 95% CI 1.6–2.9), and instrumental vaginal delivery (OR 1.4, 95% CI 1.1–1.7).

CONCLUSION

Women who have had a successful external cephalic version for breech presentation are at increased risk for cesarean delivery and instrumental vaginal delivery as compared with women with a spontaneous cephalic presentation. Nevertheless, with a number needed to treat of three, external cephalic version still remains a very efficient procedure to prevent a cesarean delivery.

Introduction

Breech presentation occurs in 3 to 4% of all term pregnancies and significantly contributes to the overall cesarean delivery rate. External cephalic version is a safe and effective procedure to reduce the frequency of breech presentation at term and consequently the number of cesarean deliveries for this condition. A Cochrane review on external cephalic version in term pregnancies showed this procedure to be effective in the reduction of noncephalic birth (relative risk 0.46, 95% confidence interval (CI) 0.31–0.66) and cesarean delivery (relative risk 0.63, CI 0.44–0.90).¹ International guidelines recommend an external cephalic version to all women with an uncomplicated breech presentation at term.^{2–4} There remains, however, controversy on the question whether the risk of cesarean delivery is increased for women with a fetus in cephalic position after a successful version compared with women with a spontaneous cephalic presentation. A review by Chan et al. in 2004⁵ found a two times increased risk for cesarean delivery in women after a successful external cephalic version. Since this review, there are two studies published, which confirm these findings,^{6,7} but also two studies that could not find a significant difference.^{8,9} Because of this controversy, we wanted to update the review by Chan et al. from 2004. Additionally, we wanted to examine the risk of instrumental vaginal delivery after a successful version and stratify our findings for nulliparous and multiparous women.

Sources

The review was conducted in accordance with the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines.¹⁰ Together with a librarian, we performed a computerized search in MEDLINE, Embase, ClinicalTrials.gov, Cumulative Index to Nursing and Allied Health Literature, and the current Cochrane databases from conception until April 2013 to identify articles reporting on the mode of delivery after a successful external cephalic version. Language restrictions were not applied. References from identified publications were manually searched for additional relevant articles. Together with a clinical librarian, we developed a search strategy including the keywords: “version,” “version fetal,” “ECV,” “breech presentation,” and “breech.” The complete electronic search is available from the first author. Reference Manager 12 was used to manage the results of all searches.

Study selection

Two independent reviewers (M.d.H., J.V.) screened the electronic searches for eligible studies by title and abstract. All identified articles were retrieved in full and assessed by both reviewers using the same standardized data extraction form. Any disagreements were resolved by consensus and, if necessary, by a third reviewer (M.K.). Cohort studies, case-control studies, and cross-sectional studies were all eligible for inclusion if they made a comparison between the mode of delivery in pregnancies after a successful external cephalic version and spontaneous cephalic pregnancies. A two-by-two table had to be available from the articles, either directly or retractable from the data supplied. When data or results were unclear or missing, the authors were contacted for further information. We undertook a quality assessment for all included articles using the Newcastle–Ottawa Scale. Each study was evaluated on three broad perspectives, first selection of the study groups, second comparability of the groups, and third ascertainment of the exposure or outcome of interest. Study quality was graded as poor (1–3 points), intermediate (4–6 points), or high (7–9 points).¹¹ From the data of each study, two-by-two tables were constructed, and odds ratios (ORs) and their 95% CIs were calculated. The I^2 test was used to assess homogeneity using an I^2 value of 30% as a threshold. A common OR with a 95% CI was calculated for each exposure by means of the Mantel-Haenszel method. If homogeneity was rejected, a random effects model was used to calculate the common OR. Potential reasons were explored to explain heterogeneity using subgroup analysis and sensitivity analysis for study quality. Funnel plots were used to assess any publication bias. Review Manager 5 was used to construct forest plots and visualize the data. We estimated the number needed to treat for additional beneficial outcome with a 95% CI for the outcome cesarean delivery. In this review, the number needed to treat for an additional beneficial outcome is the number of women with a breech presentation at term who are offered an external cephalic version rather than no external cephalic version to prevent one cesarean delivery.

Results

The initial computerized search detected 1,471 studies, of which, after excluding the duplicate articles, 810 studies remained. After reviewing title and abstract of these 810 articles, 26 were selected for assessment of the full article. Of these 26 articles, 15 were excluded after reading them in full (Figure 1). Reasons for exclusion were insufficient data to construct a two-by-two table in 14 articles, whereas one article was excluded because it reported on the same study population as another included article. In total, 11 articles were eligible for inclusion, reporting on 46,641 women.^{6-9,12-18} In an attempt to obtain additional data, we tried

to contact the first author of all included studies by e-mail. We wanted to retrieve additional information on the indication for cesarean delivery and instrumental vaginal delivery from the studies that did not report this in their article. From the studies that did not stratify their data by parity, we wanted to retrieve this information by contacting the authors. Five authors responded,^{7,14,16-18} but none of the authors were able to provide us with additional data.

CHARACTERISTICS OF THE INCLUDED STUDIES

Characteristics and study quality of the included studies are outlined in Table 1. Of the 11 included studies, eight had a case-control design^{6-8,12,14-17} whereas three were cohort studies.^{9,13,18} Five studies were performed in the United States,^{8,14,16,17} two studies in Hong Kong,^{13,15} and one each in Japan,⁹ Israel,¹² Canada,⁷ and the United Kingdom.⁶ The number of women included in the studies ranged from 152^{14,17} to 28,726.¹³ Six studies found a significant difference in cesarean delivery rate between women after a successful version compared with the control group,^{6,7,12,13,15,18} whereas five studies did not find a significant difference.^{8,9,14,16,17} In 10 studies, tocolysis was used to facilitate the procedure, ritodrine,^{7,12,14} terbutaline,^{8,13,15-18} and salbutamol,⁶ in one study, this was unreported.⁹ The average success rate of external cephalic version was 59%. Seven studies were of high quality,^{7-9,13-15,17} four studies were graded of intermediate quality,^{6,12,16,18} and none of poor quality.

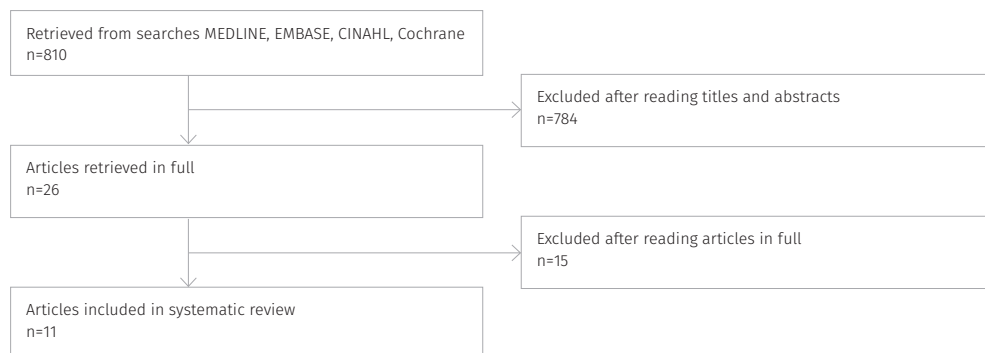


Figure 1 - Flow diagram of literature search

Table 1 - Characteristics and study quality of the included studies

Study	Study design	Number Case/control	Cesarean rate Case/control (%)	Matched for	Outcome	Study quality (Newcastle-Ottawa scale)		
						Selection	Comparability	Exposure
Jain 2010 UK	Case-control	93/103	18.2 vs 7.7	Not matched (Women with low risk pregnancies during the same time period)	Cesarean delivery Instrumental delivery	2	1	3
Clock 2009 USA	Case-control	197/394	16.8 vs 11.9	Parity History of CS Gestational age Labour onset	Cesarean delivery Instrumental delivery	3	2	3
Matsuzaki 2006 Japan	Retrospective cohort	53/2,988	15.1 vs 8.0	N/A	Cesarean delivery	3	1	3
Vézina 2003 Canada	Case-control	301/301	25.1 vs 10.5	Parity Gestational age	Cesarean delivery Instrumental delivery	3	2	3
Chan 2002 Hong Kong	Retrospective cohort	297/28,447	23.3 vs 9.4	N/A	Cesarean delivery Instrumental delivery	3	2	3
Ben-Haroush 2002 Israel	Case-control	96/192	19.8 vs 6.3	Maternal age Gravidity Parity Ethnic origin	Cesarean delivery Instrumental delivery	2	1	3
Wax 2000 USA	Case-control	38/114	10.5 vs 7.0	Gestational age Labour onset Prior vaginal delivery Cervical dilatation on admission for labour	Cesarean delivery Instrumental delivery	3	2	3
Siddiqui 1999 USA	Case-control	92/184	22.8 vs 23.4	Delivery date	Cesarean delivery	2	1	3
Lau 1997 Hong Kong	Case-control	154/308	16.9 vs 7.5	Maternal age Parity Labour onset Gestational age History of CS	Cesarean delivery Instrumental delivery	3	2	3
Laros 1995 USA	Retrospective cohort	174/11,987	31.0 vs 14.9	N/A	Cesarean delivery	2		2
Egge 1994 USA	Case-control	76/76	7.9 vs 5.3	Delivery date Parity Gestational age	Cesarean delivery	2	2	3

The Newcastle–Ottawa Scale, composed of three items, was used to produce a rating of the risk of bias. Each item could be awarded a maximum score: selection of patients a maximum of 4 points, comparability of study groups a maximum of 2 points, and ascertainment of exposure or outcome of interest a maximum of 3 points. The numbers presented represent the individual scores, per item, of each study. Combining the three items, each study can be awarded a maximum of 9 points. Study quality was graded as poor (1–3 points), intermediate (4–6 points), or high (7–9 points)

CESAREAN DELIVERY

The 11 included studies all reported on the cesarean delivery rate of pregnancies after a successful external cephalic version and pregnancies with a spontaneous cephalic presentation. The overall cesarean delivery rate was 20.7% in pregnancies after successful version and 10.9% in the pregnancies with a spontaneous cephalic presentation. Overall there were significantly more cesarean deliveries in the pregnancies after a successful version (pooled OR 2.2, 95% CI 1.7–2.8, I^2 44%) compared with the control group (Figure 2). The OR for the eight case–control studies was 2.0 (95% CI 1.6–2.5, I^2 45%) and the OR for the three cohort studies was 2.7 (95% CI 2.2–3.3, I^2 0%). Separate analysis of seven high-quality studies^{7–9,13–15,17} revealed a pooled OR of 2.4 (95% CI 2.0–2.9) with low statistical heterogeneity (I^2 17%); data not shown. Six case–control studies^{6,7,14,15,17} and three cohort studies^{9,13,18} reported on the indication for cesarean delivery and made a distinction between cesarean delivery for dystocia or suspected fetal distress. There were significantly more cesarean deliveries for dystocia (pooled OR 2.2, 95% CI 1.6–3.0, I^2 33%) in the group of women after a successful version (Figure 3) (case–control studies pooled OR 1.9, 95% CI 1.4–2.7, I^2 19%; cohort studies pooled OR 2.7, 95% CI 2.1–3.6, I^2 29%). We also found an increased risk for cesarean delivery after successful version for fetal distress (pooled OR 2.2, 95% CI 1.6– 2.9, I^2 10%; Figure 4) (case–control studies pooled OR 1.9, 95% CI 0.95– 3.8; cohort studies pooled OR 2.5, 95% CI 1.7– 3.5). Funnel plots of each analysis showed moderate asymmetry; data not shown.

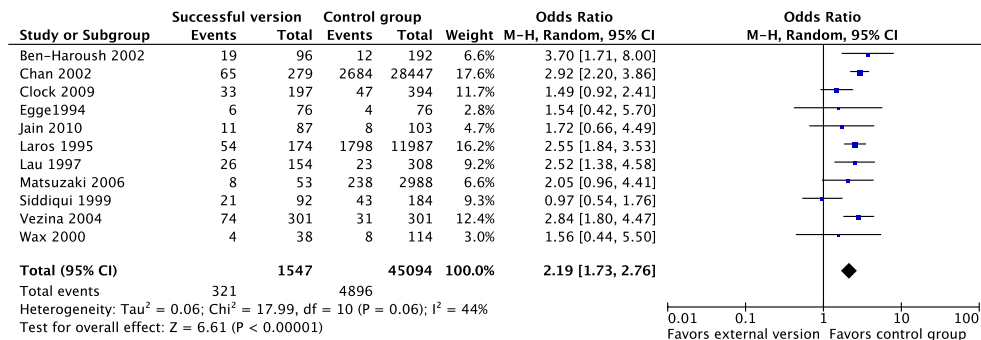


Figure 2 - Overall cesarean delivery rates in the version and control groups.

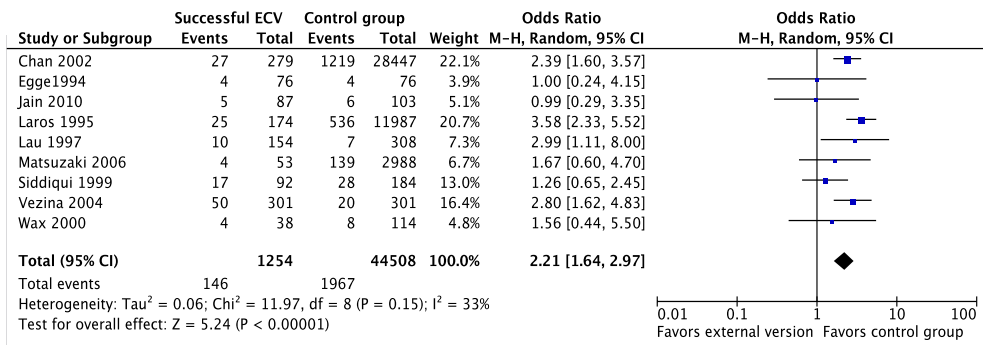


Figure 3 - Cesarean delivery rates for dystocia in the version and control groups.

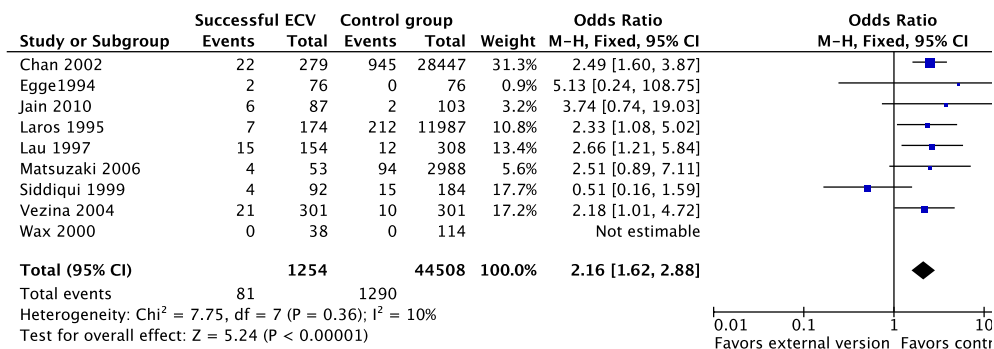


Figure 4 - Cesarean delivery rates for fetal distress in the version and control groups.

INSTRUMENTAL VAGINAL DELIVERY

There were seven studies reporting on the incidence of instrumental vaginal delivery, six studies with a case-control design^{6-8,12,15,17} and one cohort study.¹³ There were significantly more instrumental vaginal deliveries in the group of women after a successful version compared with the women with a spontaneous cephalic-presenting fetus (pooled OR 1.4, 95% CI 1.1–1.7, I² 22%) (Figure 5). Separate analysis of five high-quality studies revealed a similar odds ratio of 1.4 (95% CI 1.1–1.7, I² 9%).^{7,8,13,15,17} Only one study examined the indication for instrumental delivery.¹³ This study showed a higher incidence of instrumental delivery for the indication prolonged second stage of labor with 8.2% instrumental deliveries in the external cephalic version group compared with 6.7% in the control group. For the indication fetal distress, this study reported 5.0% instrumental deliveries in the external cephalic version group and 5.6% in the control group.

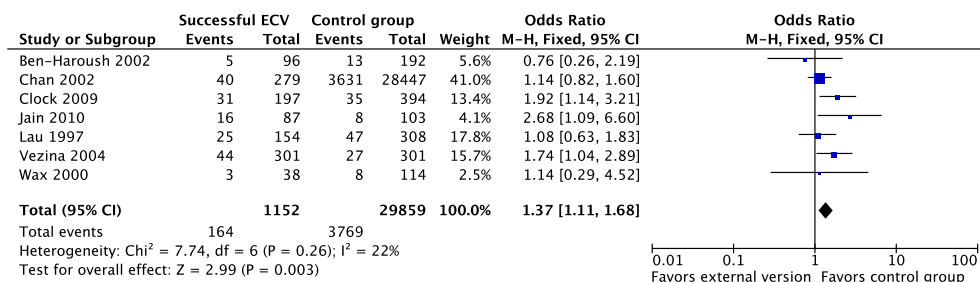


Figure 5 - Instrumental vaginal delivery rates in the version and control groups

There were two studies that analyzed their data separately for nulliparous (N=527) and multiparous (N=646) women.^{7,8} When we combined the data from both studies, we found a significantly increased risk for cesarean delivery after successful version for both nulliparous (pooled OR 1.8, 95% CI 1.1–2.9, I^2 34%) and multiparous women (pooled OR 3.4, 95% CI 1.5–8.0, I^2 42%; Figure 6).

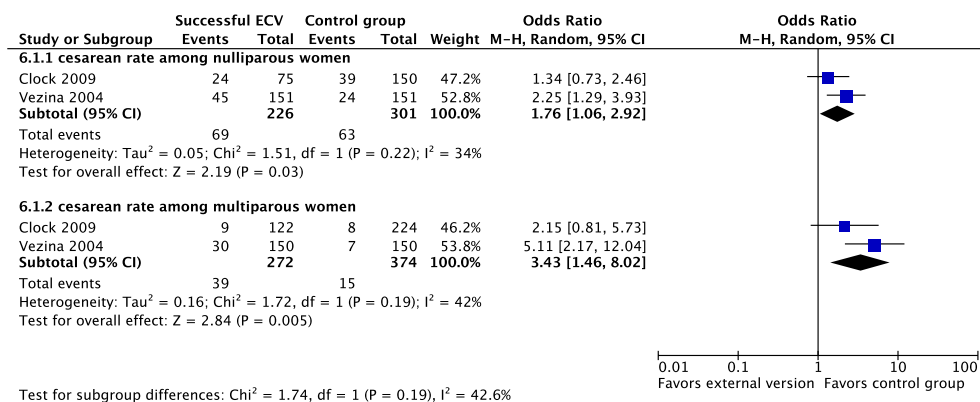


Figure 6 - Overall cesarean delivery rates by parity in the version and control groups

The average success rate of external cephalic version of the studies included in this review was 59%. The average cesarean delivery rate for women after a successful external cephalic version in this meta-analysis was 21%. Based on the literature, we defined a control event rate of 0.85, considering an 85% cesarean delivery rate when breech position persists.¹⁹⁻²¹ The experimental event rate was calculated by combining the cesarean delivery rate of women after a successful version with the cesarean delivery rate of the women after an unsuccessful version, resulting in a 47% cesarean delivery rate in the group of women after an external cephalic version, which makes the absolute risk reduction $0.85 - 0.47 = 0.38$ and the estimated number needed to treat $1/0.38 = 2.6$ (95% CI 2.0–3.9).

Conclusion

This meta-analysis shows persuasive evidence that women after a successful external cephalic version are at increased risk for cesarean delivery as well as instrumental vaginal delivery. Our findings are in line with the review by Chan et al. from 2004 that showed a twofold increased risk for cesarean delivery in women after a successful external cephalic version. We found five additional studies that examined the relationship between a successful external cephalic version and delivery outcome.

The strength of our findings is based on compliance with stringent criteria for performing a systematic review and the sensitivity analysis restricted to high-quality studies that upheld our main results. Although the present study was performed according to established methodology, there are some limitations. First, we were only able to perform univariable analyses, because we were dependent on the information provided in the articles and did not have individual patient data from the original studies. Not all factors with a higher risk for cesarean delivery could be matched for; eg, advanced maternal age, macrosomia, maternal medical complications, and prior cesarean delivery. Multivariable analyses or analysis of individual patient data may well find less strong associations than we found.²² Another limitation was the heterogeneity among the included studies, for the outcomes cesarean delivery and parity, which was not found in separate analysis of only high-quality studies. We included 11 studies in our meta-analysis of which six studies found a significant difference in cesarean delivery rate between women after a successful external cephalic version compared with the control group;^{6,7,12,13,15,18} three of these studies were also included in the review of Chan et al,^{13,15,18} although five studies did not find a significant difference.^{8,9,14,16,17} Nevertheless, all studies except for one found a higher percentage of cesarean delivery in women after a successful external cephalic version compared with their control group.¹⁶ Small sample size could have been an explanation that some studies did not find a significant difference. The main difference in the study by Siddiqui et al. was that the cesarean delivery rate in the control group was much higher 23.4% than in all other included studies, for which we could not find an explanation.¹⁶ Because funnel plots of each analysis showed moderate asymmetry, possible publication bias could not be excluded. The association that we found, between a successful external cephalic version and cesarean delivery, was slightly stronger for multiparous (pooled OR 3.4, 95% CI 1.5– 8.0) than for nulliparous women (pooled OR 1.8, 95% CI 1.1– 2.9). These analyses are based on only two case–control studies, and CIs overlapped. Therefore, these data should be interpreted with caution.

The reasons why women after a successful external cephalic version have an increased risk for operative delivery compared with women with a spontaneous cephalic presenting fetus remain unclear. Several hypotheses are suggested that try to explain this difference. First, it is thought that breech fetuses are biologically different from cephalic-presenting

fetuses with a smaller head circumference, lower birthweight, lower fetoplacental ratio, and different heart rate patterns in utero.^{5,23,24} This suggests that breech fetuses might be less tolerant to labor and show earlier signs of fetal distress. Second, known risk factors for breech presentation such as uterine anomalies and maternal pelvic configuration may also be a reason for a higher risk of dystocia during labor, thus increasing the operative delivery rates.⁷ A third explanation could be that the women with an unengaged breech are more likely to have a successful external cephalic version and during labor to have an unengaged cephalic presenting fetus with an unmolded head in an asynclitic position.⁷ This hypothesis is also supported by a study by Kabiri et al. that demonstrated an increased risk for intrapartum cesarean delivery in women with a successful version if delivery occurred within four days after the procedure.²⁵ A fourth explanation could be that women with a successful version have an increased uterine compliance, which can cause abnormal uterine contractility during labor.⁷

One of the main benefits of a successful external cephalic version is the decrease in cesarean delivery rate. With this study we show that women after a successful external cephalic version are at increased risk for operative delivery compared with women with a spontaneous cephalic-presenting fetus. Nonetheless, these rates are still significantly lower than the rates of cesarean delivery performed for primary breech presentation. With an estimated number needed to treat of three, this procedure still seems very beneficial. Therefore, we still advise an external cephalic version to all women with an uncomplicated breech presentation at term.

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