Management of preterm delivery in women with abnormal fetal presentation
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Citation for published version (APA):

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Subsequent pregnancy outcome after preterm breech delivery, a population based cohort study

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Accepted Journal Maternal-Fetal and Neonatal Medicine
Abstract

Objective To investigate the effect of the mode of delivery in women with preterm breech presentation on neonatal and maternal outcome in the subsequent pregnancy.

Methods Nationwide population based cohort study in the Netherlands of women with a preterm breech delivery and a subsequent delivery in the years 1999 to 2007. We compared planned caesarean section versus planned vaginal delivery for perinatal outcomes in both pregnancies.

Results We identified 1,543 women in the study period, of whom 259 (17%) women had a planned caesarean section and 1,284 (83%) women had a planned vaginal delivery in the first pregnancy. In the subsequent pregnancy, perinatal mortality was 1.1% (3/259) for women with a planned caesarean section in the first pregnancy and 0.5% (6/1284) for women with a planned vaginal delivery in the first pregnancy, (aOR 1.8; 95% CI 0.31-10.1). Composite adverse neonatal outcome was 2.3% (6/259) versus 1.5% (19/1284), (aOR 1.5; 95% CI 0.55-4.2). The average risk of perinatal mortality over two pregnancies was 1.9% (10/518) for planned caesarean section and 2.0% (51/2568) for planned vaginal delivery, (OR 0.98; 95% CI 0.49-1.9).

Conclusion In women with a preterm breech delivery planned caesarean section does not reduce perinatal mortality, perinatal morbidity or maternal morbidity rate over the course of two pregnancies.

Keywords
Subsequent pregnancy, neonatal morbidity and mortality, maternal morbidity and mortality, preterm breech presentation, caesarean section

Introduction

Breech presentation occurs in 3.4% of all term pregnancies, but it occurs more frequently in preterm delivery [1]. In term breech presentation, the Term Breech Trial [2] reported a decrease in poor perinatal outcome in case of an elective caesarean delivery compared to a trial of labour (1.6 vs. 5.5%, RR 0.33; 95% CI 0.19-0.56). This finding was confirmed in a recent systematic review reporting on 27 studies that had studied more than 250,000 pregnancies, and in which perinatal mortality rates were 0.3% after planned vaginal delivery and 0.05% after elective caesarean delivery.[3]

In a recent Dutch study, we confirmed the positive impact of planned caesarean section for term breech delivery, as the shift towards elective caesarean section resulted in a decrease of perinatal mortality and morbidity among women delivering a child in breech at term [4]. In the controversy on term breech delivery, it can be concluded that the risks of poor neonatal outcome after vaginal delivery are low, but can be improved by caesarean section, and that this information should be used in a process of counselling and shared decision making involving women with a child in breech position at term.

In case of preterm breech delivery, there is also controversy on the optimal mode of delivery. Randomized controlled trials failed to achieve the planned number of recruited women, thus leaving wide uncertainty among the estimates of treatment effect [5]. In the absence of adequately powered randomised clinical trials, the best available evidence has to be obtained from cohort studies. A recent review of cohort studies indicated a caesarean section to be safer for the fetus and reduces neonatal mortality as compared to vaginal delivery. [6] In addition, we recently studied perinatal outcome in preterm breech deliveries in The Netherlands in the years 2000-2011, a population of 8,356 women with an intended vaginal delivery rate of 77%. We concluded that in women delivering a preterm breech fetus, intended caesarean delivery is associated with reduced perinatal mortality and morbidity [7].

An important disadvantage of a caesarean section is its impact on future pregnancies: more women will have a scarsed uterus in subsequent pregnancies with accompanying risks of complicated placentaion, uterine rupture and renewed caesarean section, resulting in maternal and fetal mortality and morbidity.[8,9] In a recent comparison among women with a baby in breech presentation at term, we studied a policy of elective caesarean delivery followed by repeat elective caesarean delivery as compared to intended vaginal delivery. We found that elective caesarean delivery resulted in the lowest perinatal mortality and morbidity rates when studied over two pregnancies [10].

The question of the impact of the mode of delivery in preterm breech delivery on the next pregnancy has by our knowledge not been addressed. Here, we report the
impact of mode of delivery in women with a preterm breech presentation on the outcome of the first and the subsequent pregnancy.

Methods

This study was performed using data from a retrospective national cohort registered in the Netherlands Perinatal Registry (PRN). The PRN consists of population-based data containing information on pregnancies, deliveries and (re)admissions until 28 days after birth.

The PRN database is obtained by a validated linkage of three different registries: the midwife registry (LVR 1), the obstetricians registry (LVR 2) and the neonatology registry (LNR) of hospital admissions of newborn infants. [11] The coverage of the PRN is approximately 96% of all deliveries in the Netherlands and currently includes over 1.9 million records derived from deliveries in the last decade. All PRN data are recorded by the caregivers during prenatal care, delivery and the neonatal period. The data are annually sent to the national registry office, where a number of range and consistency checks are conducted.

In order to identify the second pregnancy of women who had a preterm breech delivery in their first pregnancy, we used a longitudinal linkage procedure. This was necessary, because the records that are included in the PRN registry are entered at the level of the child, and there is no unique maternal identifier available in the registry to follow-up on outcomes of the subsequent pregnancy of the same mother. Details of procedure for this longitudinal linkage method are described by Schaaf et al.[12]

All nulliparous women with a singleton fetus in breech presentation who delivered preterm in the years 1999-2007, and had a subsequent pregnancy in the same period, were selected for the present study. Exclusion criteria were antepartum fetal death, a child with major congenital malformations, preeclampsia and fetal growth restriction (growth < P5).

We analysed the outcomes of the first pregnancy (from women delivering in preterm breech presentation) and the subsequent pregnancy in the same woman according to the intended mode of the first delivery. Outcome measures were perinatal mortality (defined as fetal death during labour and neonatal death within the first 28 days after birth) and neonatal morbidity, defined as a 5-minute Apgar score < 4 and birth trauma (which included intracerebral bleeding, cephalic hematoma, facial nerve paresis, brachial plexus lesion, fracture of clavicle, humerus or femur and other trauma). Adverse neonatal outcome was defined as a composite measure of mortality and morbidity.

Maternal outcome measures were maternal mortality and maternal morbidity. Maternal morbidity was defined as uterine rupture, postpartum haemorrhage (PPH >1000 ml, according to Dutch guidelines) and need for a blood transfusion [13]. Adverse maternal outcome was defined as a composite measure of maternal mortality and morbidity.

Statistical Analysis

We compared the groups for the following baseline characteristics: gestational age at first delivery, maternal age, maternal ethnicity, socio-economic status and mean birth weight of the first child. We also reported inter pregnancy interval, gestational age and mean birth weight at subsequent delivery. We then calculated the incidence of adverse pregnancy outcomes in the index and the subsequent pregnancy for both groups. As outcomes of the index pregnancy have been presented previously, we report here on the subsequent pregnancy and of the two pregnancies combined. Odds ratios and their 95% confidence interval (CI) were calculated for these outcomes. We also performed multivariate analysis, in which we adjusted for maternal age, gestational age (first pregnancy), mode of delivery, birth weight of the first child and interpregnancy interval. To assess the combined outcome of the index pregnancy and the subsequent pregnancy we calculated the average neonatal and maternal composite outcome scores over the two pregnancies. Also, we described every case of perinatal death in the subsequent pregnancy on case-level.

Furthermore, we performed a sensitivity analysis in which we excluded women with pre-eclampsia or severe growth restriction (IUGR <P5) in the subsequent pregnancy. To mimic a scenario, in which women who had had a caesarean delivery in the first pregnancy always delivered by caesarean section in the second pregnancy, we did a sensitivity analysis in which all women with a trial of labour after a caesarean section in the first pregnancy were excluded. Data were analysed using SAS statistical software package version 9.2 (SAS Institute Inc, Cary, NC, USA).

Results

There were 272,551 women who delivered during the study period and of whom the outcome of the first and the second pregnancy could be linked. Of these, 271,008 were excluded: 258,013 because these women did not have a preterm breech delivery in their first pregnancy, 7,480 women because of a multiple pregnancy, 4,730 women...
because their child had severe congenital abnormalities, 203 women because of fetal death before onset of labour and 582 for preeclampsia or severe fetal growth restriction in the first pregnancy. Thus, we were able to include 1,543 women in this study, 259 of whom had a planned caesarean section and 1,284 of whom had a planned vaginal delivery.

Baseline characteristics are summarized in table 1. There were no significant or clinically relevant differences between the two groups. Median gestational age at first delivery was 34.5 weeks for both planned caesarean section and planned vaginal delivery (p=0.94), and mean maternal age was 29.2 versus 28.9 years for planned caesarean section and planned vaginal delivery, respectively (p=0.23). Also, mean interval to the second pregnancy (30.5 versus 31.0 months) as well as characteristics of the second pregnancy were comparable.

All 259 women in the planned caesarean section group had a caesarean section. In the planned vaginal delivery group, 740 out of the 1,284 (58%) women had a vaginal delivery, while 544 women had a planned caesarean delivery. Perinatal mortality in the index delivery, while 544 women had a caesarean delivery. Perinatal mortality in the index

| Table 1: Baseline characteristics of the cohort of preterm breech deliveries and subsequent pregnancy |
|-------------------------------------------------|-------------------------------------------------|----------------|
| **P-value**                                     | **Planned Caesarean Section**                    | **Planned Vaginal Delivery** |
| Mean maternal age at first delivery in years (SD) | N = 259                                          | N = 1,284         |
| 29.2 (4.2)                                      | 28.9 (3.8)                                      | 0.23             |
| Median gestational age at first delivery in weeks (SD) |                                      |                  |
| 34.5 (2.7)                                      | 34.5 (2.4)                                      | 0.94             |
| Mean birth weight first baby in grams (SD)      |                                            |                  |
| 2332 (677)                                      | 2380 (565)                                      | 0.22             |
| Western ethnicity, n (%)                        |                                            |                  |
| 267 (95.4%)                                     | 1202 (93.5%)                                    | 0.50             |
| Low socio-economic status, n (%)                |                                            |                  |
| 46 (17.8%)                                      | 228 (17.8%)                                     | 0.99             |
| Median interval to subsequent pregnancy in months (SD) |                                      |                  |
| 30.5 (13.8)                                     | 31.0 (13.7)                                     | 0.55             |
| Mean maternal age at second delivery in years (SD) |                                      |                  |
| 31.8 (4.1)                                      | 31.5 (3.9)                                      | 0.33             |
| Median gestational age at second delivery in weeks (SD) |                                      |                  |
| 38.5 (2.5)                                      | 38.2 (2.2)                                      | 0.06             |
| Mean birth weight second baby in grams (SD)     |                                            |                  |
| 3213 (680)                                      | 3193 (579)                                      | 0.62             |

Table 1: Baseline characteristics of the cohort of preterm breech deliveries and subsequent pregnancy

The outcomes of the subsequent pregnancy according to the intended mode of delivery in the first pregnancy are summarized in table 2. Caesarean section rates were 39% (100/259) versus 19% (244/1284) (aOR 3.7, 95% CI 2.5-5.5), respectively. Perinatal mortality was 1.1% (3/259) in women with a planned caesarean section in the index pregnancy versus 0.5% (6/1284) in women with a planned vaginal delivery in the index pregnancy (aOR 1.8, 95% CI 0.31-10.1). Composite adverse neonatal outcome in the second pregnancy was 2.3% (6/259) versus 1.5% (19/1284) (aOR 1.5, 95% CI 0.55-4.2). The risk of preterm birth < 37 weeks of gestation was 15.8% (41/259) versus 20.8% (267/1284) (aOR 0.49, 95% CI 0.29-0.84).

The rate of HPP > 1,000 ml in the subsequent pregnancy was 7.0% (18/259) in the planned caesarean section versus 5.4% (69/1284) in the planned vaginal delivery group (aOR 1.4; 95% CI 0.85-2.2), uterine rupture 0.4% (1/259) versus 0% respectively. Composite adverse maternal outcome in the second pregnancy was 7.3% (19/259) for planned caesarean section versus 5.4% (69/1284) for planned vaginal delivery (aOR 1.5; 95% CI 0.86-2.5). There were no cases of maternal mortality in both groups.

There were nine women who suffered perinatal death in the subsequent pregnancy, four below 28 weeks, three between 30 and 37 weeks and two after delivery at term. Five baby’s died intrapartum and four neonatally. All six women who suffered perinatal death in the subsequent pregnancy after intended vaginal delivery in the index pregnancy, had an emergency caesarean section in the index pregnancy and a vaginal delivery in the subsequent pregnancy.

We performed a sensitivity analysis in which we excluded women with preeclampsia and women with a fetus with severe growth restriction (growth < P5) in the subsequent pregnancy in which we excluded 145 women (45 women in the planned caesarean section group and 100 women of the planned vaginal delivery group), leaving 1,398 for this analysis. The risk of preterm birth before 37 weeks was 14.5% for planned caesarean section versus 5.4% (267/1284) (aOR 0.49, 95% CI 0.29-0.84).

We performed a subgroup analysis in which we excluded women with a trial of labour in the subsequent pregnancy. The outcomes of preterm birth did not change significantly.

To mimic the scenario of “once a caesarean section always a caesarean” we also performed a subgroup analysis in which we excluded women with a trial of labour in the subsequent pregnancy after a caesarean delivery in the first pregnancy. To do so, we excluded 738 women (194 women in the planned caesarean section group and 544 in the planned vaginal delivery group). There were no cases of perinatal mortality or severe morbidity in the subsequent pregnancy in both groups.
Finally, we calculated the average maternal and neonatal composite outcome scores over the two pregnancies (table 3). The average risk of perinatal mortality over two pregnancies was 1.9% (10/518) for planned caesarean section and 2.0% (51/2568) for planned vaginal delivery in the first pregnancy, (OR 0.98; 95% CI 0.49-1.9). The average risk of perinatal morbidity was 5.2% (27/518) in the planned caesarean section group and 5.4% (138/2568) in the planned vaginal delivery group (OR 0.97; 95% CI 0.64-1.5). The average risk of maternal morbidity was 5.4% (28/518) for planned caesarean section and 3.8% (97/2568) for planned vaginal delivery (OR 1.5; 95% CI 0.95-2.2).

5.4% (138/2568) in the planned vaginal delivery group (OR 0.97; 95% CI 0.64-1.5). The average risk of maternal morbidity was 5.4% (28/518) for planned caesarean section and 3.8% (97/2568) for planned vaginal delivery (OR 1.5; 95% CI 0.95-2.2).
Discussion

We analysed the impact of mode of delivery in women with a preterm breech delivery on the first and subsequent pregnancy. Analysis was performed according to the intended mode of the first delivery: planned caesarean section versus planned vaginal delivery.

Perinatal mortality rates in the subsequent pregnancy were not significantly different for planned caesarean section as compared to planned vaginal delivery in the first pregnancy, and the same applied for neonatal and maternal morbidity rates. The risk of recurrent preterm delivery after 32 weeks was decreased in women with a planned caesarean section in the index pregnancy.

Strengths and limitations of our study

Our study is the first study that compares neonatal and maternal outcomes in the subsequent pregnancy after a pregnancy complicated by preterm breech presentation. An important strength of our study is that it reports on a large cohort of women with an intended vaginal breech delivery, which gave us the unique opportunity to study the effect of the mode of delivery in preterm breech presentation and the subsequent pregnancy.

We acknowledge that some of the outcomes that we used in this study (such as uterine rupture and maternal mortality) are rare, thus hampering the capacity of our study to find statistical significant differences for some outcomes. However, most outcomes of this study are not so rare and a sample size of 1,500 women generated sufficient power.

The decreased risk of recurrent preterm delivery after 32 weeks of gestation in women who delivered by planned caesarean section in their first pregnancy was even lower as might be expected. In view of an overall recurrence rate of preterm delivery of 20% [14] the recurrence rate of 15% among women who delivered preterm in breech presentation by planned caesarean section in our study is low.

An explanation for this lower incidence of recurrent preterm birth might be that because of the caesarean section in the first pregnancy there was less dilatation of the cervix whereby it remains stronger than in case of a vaginal delivery with full cervical dilatation. The combined adverse neonatal outcome and the combined adverse maternal outcome were not significantly different for both groups.

The caesarean section rate in the subsequent pregnancy in women with a planned vaginal delivery in the first pregnancy is 19%. This high percentage might be partly due to the 15% recurrence rate of breech presentation in the subsequent pregnancy and due to the relatively high emergency caesarean section rate in the first pregnancy.

The scenario “once a caesarean section, always a caesarean” in our study did not lead to an improved combined perinatal outcome of the first and subsequent pregnancy; although there were no perinatal deaths in the subsequent pregnancy in this scenario. An explanation might be that by excluding all women with a trial of labour, the number of women that remain for analysis in this scenario becomes too small to reach statistical significance.

Overall, the average risk of perinatal mortality, neonatal morbidity or maternal morbidity over the two pregnancies were not significantly different for both groups.

Based on the results of our present study we conclude that in nulliparous women with a preterm breech delivery in their first pregnancy, planned caesarean section does not lead to a significantly different average perinatal mortality, neonatal morbidity or maternal morbidity rate over the two pregnancies. This should be taken into account when counselling women on the mode of delivery in preterm breech presentation. The decision on the optimal mode of delivery should be a shared decision of the pregnant woman, her partner and the responsible obstetrician in which possible future pregnancies are also an important factor. The rates produced by this study might be helpful in such a process.

Declaration of interest

The authors report no declarations of interest.
References


