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Risk factors for uterine rupture during a vaginal birth after one previous caesarean section: a case–control study

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ABSTRACT

Objective: To study risk factors for uterine rupture (UR) in women with one previous caesarean section (CS) undergoing a vaginal birth after CS (VBAC).
Study design: A nested case–control study was conducted. Baseline characteristics, general obstetric history, details of the previous CS, current delivery and maternal and neonatal outcome were analysed for 41 cases with a UR and 157 controls (no rupture). Data were extracted from 21 Dutch hospitals.
Results: Labour induction was more common in cases than in controls (51% vs. 25% respectively, $P = 0.001$), and in case of induction therapy especially the use of prostaglandins (PGE2) was more frequent in the case group (86% vs. 46%, $P = 0.014$ for cases and controls respectively). Patients with UR had a significantly lower Bishop score (median: 2.0 vs. 4.0, $P = 0.005$) and received more augmentation of labour compared to controls (36% vs. 18%, $P = 0.010$). In the multivariate analysis induction with PGE2 and oxytocin, induction with PGE2 alone, and augmentation of labour were independent variables affecting the occurrence of UR (respectively OR 13.0, CI 2.3–74.2; OR 4.6, CI 1.9–11.3 and OR 2.7, CI 1.2–6.3). Forty-four percent of the ruptures can be explained by induction of labour with prostaglandins ± oxytocin.
Conclusion: Having studied baseline characteristics, general obstetric history, details of the previous CS and of the current delivery, we show that no factors other than the use of PGE2 (±oxytocin) in response to a low Bishop score, and augmentation of labour with oxytocin are associated with an increased risk for UR in women undergoing VBAC after one previous CS.

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1. Introduction

Uterine rupture (UR) is a severe complication of labour with risks of serious maternal morbidity, maternal mortality and perinatal death [1–5]. Although UR can occur in unscarred uteri, in western societies UR generally occurs in women undergoing a vaginal birth after caesarean section (VBAC) [5–7].

Over the past decades, many risk factors have been investigated and described, such as maternal age, gestational age at the previous caesarean section (CS), previous vaginal delivery, caesarean scar type, type of suture, the presence of post-partum fever or wound infection, inter-delivery interval, anaesthesia and fetal weight [8–23]. There is conflicting evidence especially whether induction of labour, with or without PGE2, is an important risk factor [23–28].

A prospective multicentre study conducted in The Netherlands showed that UR occurred in 1.5% of women undergoing VBAC ($n = 48$) [29]. In follow-up of this prospective study, the aim of the present study is to determine which of these mentioned risk factors for UR can be confirmed in women undergoing VBAC after one previous CS. In addition, we investigated other possible risk factors such as the Bishop score prior to induction of labour, the number of doses, days and dosage of prostaglandins (PGE2) and the time of birth during the day (day, evening or night).

2. Materials and methods

Between April 1st 2002 and March 31st 2003, we performed a prospective cohort study on the obstetric management and outcome of women with a history of CS. Thirty-eight hospitals in The Netherlands participated in this study. During this study period 4569 women with a previous CS were included, of whom 71.7% attempted a VBAC. Of these 3276 women, 48 women (1.5%) experienced a UR during the VBAC, which took place in 26 of the 38

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hospitals. UR was defined as a separation of the uterine wall with clinical symptoms, such as fetal heart rate abnormalities, abdominal pain, vaginal bleeding, signs of intra-abdominal bleeding, haematuria, loss of engagement of the presenting fetal part or maternal shock. Results on mode of delivery of this cohort have been described previously [29].

In this nested case–control study cases were defined as patients with a previous CS in whom UR occurred during a VBAC. We included only patients with a history of one previous CS. For each case, four control subjects were selected. To control for difference in management strategies among the centres [30], the controls were chosen to be the four previous women with a history of one CS undergoing VBAC in the same hospital as the case, but in whom no rupture occurred.

The following baseline characteristics were documented: maternal age, parity, number of vaginal deliveries in total and after the previous CS. Details of the previous CS included the indication of the previous CS, gestational age of the previous CS, closure of the uterus in a single or double layer, the presence of post-operative fever or wound infection. The details of the current delivery consisted of gestational age, inter-delivery interval (type of) induction, Bishop score, PGE2 (number of doses, number of days given and total dosage), augmentation of labour, analgesia, neonatal birth weight and the time of birth. For the latter, days were divided in three periods: day (08:00–18:00), evening (18:00–23:00) and night (23:00–08:00).

Data were collected into an Excel data sheet (Microsoft Corporation, Redmond, Wash) and analysed using SPSS 12.0 for Windows. Univariate analysis was performed using Mann–Whitney tests for continuous variables and Chi-squared tests for categorical variables. $P < 0.05$ was considered statistically significant. Multivariate analysis was performed using logistic regression with UR as the dependent variable. To ensure no variables would be missed in this analysis, we also entered variables in the model that nearly reached statistical significance in the univariate analysis (variables with a P-value <0.1). Final results were reported as adjusted odds ratios (OR) and 95% confidence intervals (CI). The induction and augmentation of labour variables were added on dummy variables, for which no use of uterotonic agents was used as a reference.

3. Results

Of the 26 hospitals we approached, 21 were willing to participate in the study. Through registration forms we were able to receive detailed information from 41 rupture and 157 control patients (Fig. 1).

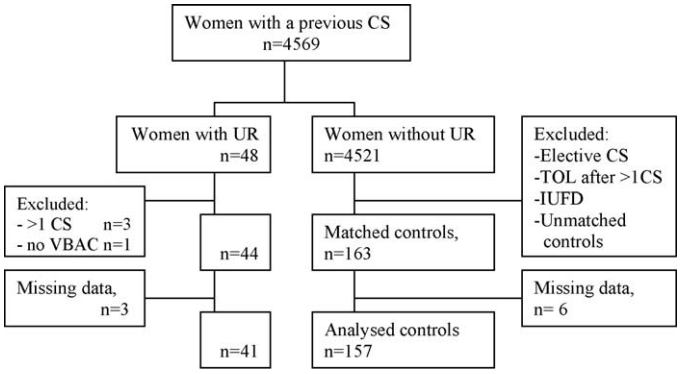

Fig. 1. Flowchart of uterine ruptures and controls. CS: caesarean section; IUFD: intra uterine fetal death; VBAC: vaginal birth after caesarean section; UR: uterine rupture.

Table 1
Baseline characteristics and obstetrical history.

Characteristic	Cases ($n=41$) N (%) or mean (SD)	Control ($n=157$) N (%) or mean (SD)	P-values
Age	32.1 (4.5)	32.7 (4.3)	0.493
Parity	1.3 (0.7)	1.5 (1.0)	0.332
N of previous vaginal deliveries			
0	34 (82.9%)	118 (75.2%)	0.406
≥1	7 (17.1%)	39 (24.8%)	
N of vaginal deliveries after CS			
0	37 (90.2%)	127 (80.9%)	0.243
≥1	4 (9.8%)	30 (19.1%)	
Details previous CS			
Gestational age (days)	277.6 (11.4)	273.1 (23.0)	0.832
Planned (not emergency)	13 (30.3%)	47 (29.9%)	0.845
Indication of CS			
Failure to progress	15 (36.6%)	65 (41.4%)	0.611
Other	25 (61.0%)	90 (57.3%)	
Malpresentation	7 (17.5%)	29 (18.5%)	
Maternal	3 (7.5%)	7 (4.5%)	
Placental	0 (0.0%)	5 (3.2%)	
Fetal	15 (37.5%)	49 (31.2%)	
Not reported	1 (2.4%)	2 (1.3%)	
Type of suture			
Single layer	31 (75.6%)	106 (67.5%)	0.146
Double layer	3 (7.3%)	3 (1.9%)	
Not reported	7 (17.1%)	48 (30.6%)	
Fever post-partum	1 (3.0%)	6 (3.8%)	0.572
Wound infection	0 (0%)	1 (0.6%)	0.798

3.1. Baseline characteristics

Table 1 summarizes baseline characteristics, obstetric history in general and details of the previous CS. No statistically significant differences were found for age, parity, number of vaginal deliveries in total or after the previous CS. Also, no differences were observed for the gestational age at which the previous CS was performed, for the indication of the CS and whether the CS was planned or indicated as an emergency. All previous CS uterine incisions were low transverse and of the reported cases and controls six were sutured in a double layer. Complications of the previous CS, such as fever and wound infection were comparable between the groups.

3.2. Current pregnancy and current delivery details

Table 2 states the details of the current pregnancy and delivery. No differences between cases and controls were observed for gestational age or inter-delivery interval. The indication for induction of labour was comparable between the groups, but the Bishop score was significantly lower in the case group before starting induction therapy (1.7 ± 1.6 vs. 4.3 ± 2.8, $P = 0.005$). Induction of labour was more frequently observed in cases than controls (51% vs. 25%, $P = 0.001$) and PGE2 was more frequently used for induction therapy (86% vs. 46% for cases and controls respectively, $P = 0.014$). Cases more commonly received more than one dose of PGE2 than controls (72% vs. 33% of the cases and controls respectively, $P = 0.044$). The number of days that PGE2 was given and the total dosage of PGE2 were comparable between cases and controls.

The most frequently used PGE2 agent was Dinoproston (89% in both cases and controls). Sulproston was used once in the case group (5.5%). The use of more than one PGE2 agent was documented for one patient in the case group (5.5%) and two patients in the control group (11%).

Compared to PGE2, oxytocin as induction therapy was given less frequently to the case group while this was comparable in the control group. When onset of labour occurred spontaneously, the case group received augmentation of labour with oxytocin more frequently (36% vs. 18% for cases and controls respectively,

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