

Preterm Severe Neonatal Morbidity and Mortality in Breech Presentation Regarding the Onset Mode of Labor

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Research Article

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Abstract

Purpose

The objective was to assess neonatal severe morbidity in case of cervical ripening, in premature breech fetuses, comparatively at spontaneous labor.

Methods

This is a retrospective study conducted in a tertiary center.

Women with alive singleton breech between 28 and 36+6 weeks of gestation were considered. We compared women with an unfavorable cervix, who had an indication to deliver, to women in spontaneous labor.

The primary outcome was a composite morbi-mortality criterion including perinatal death, traumatic event, 5-min Apgar < 4, moderate / severe encephalopathy, seizures, Intra Ventricular Hemorrhage grade 3-4, necrotizing enterocolitis grade 2-3. The association between the onset of labor and severe neonatal morbidity was assessed by logistic regression model. A propensity score approach with inverse probability of treatment weighting was performed to control indication bias.

Results

We included 212 patients: 64 in the induced labor group and 136 in the spontaneous labor group. Labor was induced mostly for fetal growth restriction (34.4%), oligoamnios (18.7%) and pre-eclampsia (18.7%). When induced labor, 45.3% of patients delivered vaginally, and 86% when spontaneous labor.

The rate of neonatal morbidity was similar in two groups (4.7% versus 5.2%, $p=0.889$). There was no association between the onset of labor and severe neonatal morbidity (OR 0.99, 95% CI 0.2-3.6)). After applying propensity scores, induction of labor was not associated with improved severe neonatal morbidity (OR 0.9, 95% IC 0.4-2.5).

Conclusion

The onset mode of labor do not seem to have an effect on severe neonatal morbidity and mortality in preterm breech fetuses.

1. Introduction

Breech presentation occurs in 5% of deliveries and is more common preterm. Protective effect of cesarean section on the breech fetus is controversial, since publications showed divergent results on neonatal morbidity and mortality. However, vaginal delivery in breech presentation is still discussed. But it has been proved that it could be a safe option in selected patients regardless of gestational age. (1) (2) (3) (4) (5) (6) Routine cesarean section is not recommended for breech in spontaneous preterm labor.

In France, 22.6% of labors are induced ones. (7) This is a common practice in cephalic presentation. The induction of labor in term breech presentation tends to have no impact on neonatal morbidity and mortality compared to spontaneous labor. (8) (9) (10) (11) (12) This has not been reviewed for pre-term breech presentation since international societies do not recommend this practice in routine since there are very few data on the subject. (13) (14)

The aim of this study was to assess neonatal severe morbidity and mortality in case of cervical ripening when unfavorable cervix, in premature breech fetuses, comparatively at spontaneous labor.

2. Material And Methods

This was a retrospective study, conducted in a tertiary university center in Paris, France.

We included all singleton living preterm breech deliveries between 28 and 36 + 6 weeks of gestation. We excluded situations with medical contraindication to vaginal delivery (abnormal placenta implantation, multiple scarred uterus, maternal disease, cephalopelvic disproportion) and fetal malformations. We collected data from 2000 to 2018.

We compared patients in spontaneous labor versus patients with a medical indication for the child to be born with an unfavorable cervix and thereby, needing induction of labor.

The maternity protocol did not include a systematic X-ray pelvimetry for breech even if preterm.

Considering patients with an unfavorable cervix, if a delivery was indicated but not emergent and could be delayed in a few days, induction of labor was considered with a close fetal and maternal monitoring in hospitalization. Cervical ripening was performed according to the local protocol (appendix 1).

During labor whatever the onset of labor, under continuous FHR monitoring, oxytocin infusion could be used if indicated. After two hours of failure to progress with oxytocin infusion a caesarean delivery was considered.

2.1 Data collection

Data were collected retrospectively from patients' electronic medical records and medical files. All patients were identified from the department's computer database. The entire medical file was computerized and was completed prospectively at each visit, at delivery, and during the postpartum period. All data were verified at the obstetrics staff meeting the day after the delivery. All maternal and pediatric records were also reviewed individually.

2.2 Outcomes

We defined as primary composite outcome a score of neonatal mortality and severe morbidity, including complications of prematurity and complications of breech delivery, adapted to composite criteria used in the Term Breech Trial and PREMODA study. (15) (16) This composite criterion included perinatal death

(until 28 days of life), traumatic event during delivery (basal skull fracture, fracture of long bone or clavicle, brachial plexus injury), 5-min Apgar < 4, moderate or severe encephalopathy according Sarnat score, seizures within the first 24 hours, Intra Ventricular Hemorrhage grade 3 or 4, necrotizing enterocolitis grade 2 or 3.

Secondary neonatal less severe outcomes included arterial cord-blood pH at birth <7.10, intubation and ventilation > 24 hours during the first three days, and early-onset bacterial infection (proved: clinical symptoms with bacteria in blood and/or cerebrospinal fluid ; probable : clinical or biological abnormalities).

Maternal morbidity was evaluated by the following events: post-partum hemorrhage (blood loss \geq 500cc) and its management, maternal need of secondary surgery and endometritis (defined by abdominal pain and fever, abnormal discharge, biological inflammatory syndrome and positive vaginal swab).

The following labor and delivery characteristics were also analyzed: modalities of induction, duration of labor, amniotic fluid characteristics, FHR anomalies during labor, use of oxytocin and mode of delivery.

2.3 Statistical analyses

First, we compared maternal, obstetric and neonatal characteristics between the two groups. Then we conducted univariate analyses to compare the two groups for the principal and secondary outcome measures. We used Student's t, Chi², and Fisher's exact tests for the univariate analyses. To assess the association between the onset of labor and severe neonatal morbidity, we used a logistic regression model to estimate adjusted OR (OR) and 95% CI.

To further control for indication bias related to confounding factors that might influence both the choice of the onset of labor and severe neonatal morbidity, we used a propensity score approach. The propensity score was defined as the probability of a spontaneous labor based on covariates. This analysis followed a three-step process. First, a propensity score was estimated for all pregnancies by a logistic regression model with the onset of labor as the dependent variable in relation to the baseline maternal, obstetric, neonatal, characteristics (nullipara, previous cesarean delivery, previous hypertensive condition, hospitalization for premature labor, premature rupture of the membranes, prenatal corticosteroids, suspected fetal growth restriction, gestational age at delivery, weight at delivery). Then, the inverse probability of treatment weighting (IPTW) based on estimated propensity scores was used to obtain a synthetic population in which the onset of labor was independent of measured baseline covariates, as confirmed by balance standardized differences. Imbalance was checked by propensity score distribution and calculation of standardized mean differences before and after applying the IPTW. Finally, the association of the onset of labor with severe neonatal morbi-mortality was quantified by OR and 95% CIs estimated from a logistic regression model, without further adjustment.

The statistical analyses were performed using STATA software Version 13 (Stata Corp, College Station, TX, USA).

2.4 Ethics

Under French regulations, this study was exempt from Institutional Review Board approval because it was an observational study using anonymized data from medical records. Women were informed that their records could be used for the evaluation of medical practices and were allowed to opt out of these studies. The medical database was approved by the National Data Protection Authority (Commission Nationale de l'Informatique et des Libertés, CNIL no. 293683).

3. Results

On the study period, 200 patients were included, 64 (32%) in the induced labor group and 136 (68%) in the spontaneous labor group. (Figure 1)

Most maternal characteristics were comparable except for parity. Patients in spontaneous labor were more often parous women.

Regarding pregnancy characteristics, women with induced labor suffered more from gestational hypertension and preeclampsia whereas women in spontaneous labor were hospitalized for premature labor or premature rupture of the membranes. Gestational age at delivery was slightly younger in women with spontaneous labor. (Table 1)

Induced labor was performed more often for fetal growth restriction (22/64 (34.4%)), oligoamnios (12/64 (18.7%)) and preeclampsia (12/64 (18.7%)). Among those women, 45.3% had a vaginal delivery, and 54.7% of women had a cesarean section, mostly for fetal heart rate anomalies (26/35 (74.3%)).

Among women in spontaneous labor, 86% delivered vaginally and 14% needed an emergency cesarean section, for FHR anomalies in 63.2% cases.

The cervix dilation when a cesarean section occurred was lower in induced labor compared to spontaneous labor.

Comparing labor characteristics of the two groups, we can note that the induced labor group received more oxytocin during labor. (Table 2)

The rate of severe neonatal morbi-mortality was similar in two groups (4.7% when induced labor vs 5.2% when spontaneous labor, $p=0.889$). (Table 3) There is not association between the onset of labor and severe neonatal morbi-mortality (OR 0.99, 95% CI 0.2-3.6)). After applying propensity scores and assigning IPTW, compared with spontaneous labor, induction of labor was not associated with improved severe neonatal morbi-mortality (OR 0.9, 95%IC 0.4-2.5).

However, one neonatal death in the induced group and three in the spontaneous labor group occurred.

Considering the neonatal death in the induced labor group: labor was induced by prostaglandin at 36 +6 weeks of gestation for premature rupture of the membranes at 36 +5 WG, there were no fetal heart rate

abnormalities and no sign of infection during labor (labor duration: 4 hours). Vaginal delivery, performed by senior, was complicated with head entrapment needing use of forceps. There was no growth restriction (20th percentile) and pH at delivery was 7,10 with Apgar score 2/0/0. The neonate died at two days of life from multivisceral failure, autopsy did find visceral and cerebral anoxia and sign of amniotic inhalation.

The three neonatal death in the spontaneous group occurred in the delivery room. All mothers had been treated with prenatal corticosteroids.

Neonate one had a history of premature rupture of the membranes at 25 WG and was delivered at the age of 28+5 WG by cesarean section at 5 cm, performed for FHR anomalies. Amniotic fluid was clear, pH at delivery was 7.23 and Apgar score 1/0/0. Active resuscitation was performed with intra-tracheal administration of adrenaline, and decision was made to stop after 20 minutes.

Neonate two was delivered vaginally at 31+6 WG, spontaneous labor occurred after a history of PROM at 31 WG. Amniotic fluid was clear during labor with no suspicion of chorioamnionitis. It was a frank breech with need of Lovset and Mauriceau's manoeuvres at delivery. pH was 7.11, Apgar 3/1/1 and active resuscitation was started at birth, but stopped after 50 minutes.

Neonate three was also delivered vaginally at 31 WG after PROM with high suspicion of chorioamnionitis, fluid was meconial. Delivery was in complete breech with need of Lovset and Mauriceau's manoeuvres, pH at birth was 7.26, Apgar 1/1/1. Active resuscitation was stopped after 30 minutes.

Regarding maternal morbidity, there were no differences between the two groups, except from the need of transfusion, higher when induced labor ($p=0.01$) while the rate of postpartum hemorrhage was not higher in this group. (Table 4)

4. Discussion

4.1 Strengths

To our knowledge, our study is among the first questioning the possibility of inducing labor in preterm breech fetuses.

There is a poor literature on this subject and it was suggested that cervical ripening was an independent factor of neonatal and maternal outcome. (17) (18)

We used as a primary outcome a composite criterion extracted from former publications and that we reviewed for the preterm fetuses population. (4) (19) (20)

We used propensity score analysis to minimize the likelihood of incorrectly attributing any risk of neonatal morbidity to onset of labor, which is an inherent difficulty in this study.

4.2 Weakness

Nevertheless, we have a small sample of patients and we collected data retrospectively. That could conduct to lack of statistical power.

Moreover, comparing those two populations (induced and spontaneous labor group) could be discussed. In fact, the context of birth is different and could influence neonatal outcomes.

They seem to be differences in neonatal outcomes regarding the cause of prematurity. Intra-uterine environment could participate in increasing certain types of complications as intra ventricular hemorrhage and neonatal sepsis. (21)

Thus, pre-eclampsia seems to appear as an adverse factor concerning short-term neonatal outcome but the mechanism is still unknown. (22) (23)

Birth weight and especially fetal growth restriction is also correlated with neonatal outcome. Several research correlate FGR with increased morbidity and mortality in preterm fetuses. (24) (25) (26)

4.3 Interpretation

Inducing labor is a common practice when cephalic presentation.

Several studies were interested in comparing neonatal and maternal outcomes between induced and spontaneous labor in term breech fetuses. They showed no differences between those two onsets of labor.

International guidelines do mention as an option planned vaginal delivery. (13) (27) (28) (29)

But few people were interested in this same topic for preterm breech fetuses.

In our study the rate of vaginal delivery after induction is around 45%, which is fewer than the rate observed in literature when term breech fetuses (58%-65%). (10) (11) (30)

There were no differences on neonatal morbidity and mortality between induced and spontaneous labor while the induced labor population tends to be more fragile (fetal growth restriction and pre-eclampsia being the more frequent indication of birth). Neonatal death was not related with the onset mode of labor.

5. Conclusion

A strategy of induction of labor in case of preterm breech among women with unfavorable cervix allows a vaginal delivery for more than 40% of patients. We found no difference on severe neonatal mortality and morbidity between induced and spontaneous onset of labor.

Inducing labor could be discussed in preterm breech fetuses in selected patients with need to deliver within a few days.

Declarations

All authors agree for submission.

Authors contribution

Guerini Claire : Data collection and management, Manuscript writing

Korb Diane : Data analysis, Manuscript editing

Sibony Olivier : Manuscript editing

Conflicts of interest

The authors report no conflict of interest.

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Tables

Table 1: Maternal and pregnancy characteristics

	Induced labor	Spontaneous labor	P
	N = 64	N = 136	
	n (%)	n (%)	
Maternal age (y, mean ± sd)	32.4 ± 5.5	31.9 ± 5.7	0.52
< 25	7 (10.9)	16 (11.8)	0.644
[25-29]	13 (20.3)	34 (25)	
[30-34]	21 (32.8)	49 (36)	
≥ 35	23 (36)	37 (27.2)	
Body Mass Index (, mean ± sd)	23.6 ± 5.3	23.4 ± 5.6	0.82
< 18.5	31 (54.4)	58 (51.8)	0.91
[18.5-24.9]	7 (12.3)	16 (14.3)	
[25-29.9]	11 (19.3)	25 (22.3)	
≥ 30	8 (14)	13 (11.6)	
Smoker	1 (1.6)	5 (3.7)	0.41
Parity			0.165
Nullipara	34 (53.1)	58 (42.6)	0.02
Parous	30 (46.9)	78 (57.4)	
1	12 (18.8)	48 (35.3)	
2	5 (7.8)	17 (12.5)	
≥ 3	13 (20.3)	13 (9.6)	
Previous cesarean delivery	11 (17.2)	11 (8.1)	0.055
Diabetes			
Type 1 diabetes	1 (1.6)	1 (0.7)	0.58
Type 2 diabetes	1 (1.6)	0	0.14
Previous hypertensive condition	2 (3.1)	4 (2.9)	0.94
Pregnancy characteristics			
Diabetes	7 (10.9)	10 (7.3)	0.396

Gestational diabetes (diet)	3 (4.7)	7 (5.2)	0.89
Gestational diabetes (insulin)	4 (6.3)	3 (2.2)	0.279
Gestational hypertension	17 (26.6)	2 (1.5)	0.000
Preeclampsia	18 (23.1)	1 (0.74)	0.000
Mild pre-eclampsia*	5 (7.8)	1 (0.74)	0.006
Severe pre-eclampsia**	13 (20.3)	0	0.000
Eclampsia	0	1 (0.74)***	0.454
retroplacental hematoma****	2 (3.1)	3 (2.2)	0.698
Hospitalisation for premature labour	9 (14.1)	59 (43.4)	0.000
Suspected fetal growth restriction < 10th percentile	32 (50.0)	9 (6.6)	0.000
Premature rupture of the membranes	22 (34.4)	89 (66.4)	0.000
Chorioamnionitis	8 (12.5)	13 (9.6)	0.53
Prenatal corticosteroids	34 (53.1)	83 (61)	0.29
1 (2 injections)	30 (88.2)	78 (94)	0.29
2 (4 injections)	4 (11.8)	5 (6)	
Gestational age at delivery (GW, mean \pm sd)	34 \pm 1.9	33 \pm 2.7	0.004
[28-32[	7 (10.9)	47 (34.6)	0.002
[32-34[	13 (20.3)	24 (17.6)	
[34-37[	44 (68.8)	65 (47.8)	
*Mild to moderate high blood pressure, 140-159 mm Hg systolic or 90-159 mm Hg diastolic and proteinuria 0,3 - 3 g/L			
**High blood pressure greater than or equal to 160 mm Hg systolic or greater than or equal to 110 mm Hg diastolic, proteinuria > 3 g/L, oliguria, hepatic dysfunction, foetal growth restriction			
***post partum H4			
****anatomopathological examination			

Table 2: Mode of delivery, indications of cesarean section and induction of labor

	Politics of induced labor	Spontaneous labor	P
	N = 64	N = 136	
	n (%)	n (%)	
Delivery mode			
Vaginal delivery	29 (45.3)	117 (86)	
Cesarean before or during labor	35 (54.7)	19 (14)	
Indication of induced labour	N = 64		
Foetal growth restriction	22 (34.4)		
Oligoamnios	12 (18.7)		
Pre-eclampsia	12 (18.7)		
Chorioamniotitis	7 (10.9)		
Premature rupture of the membranes	6 (9.4)		
FHR anomalies	4 (6.3)		
Protéinuria	1 (1.6)		
Indication of cesarean	N = 35	N = 19	
FHR anomalies	26 (74.3)	12 (63.2)	
Foetal growth restriction	2 (5.7)	0	
HELLP	1 (2.9)	0	
Pre-eclampsia	1 (2.9)	0	
cord prolaps	1 (2.9)	2 (10.5)	
failure to progress	2 (5.7)	2 (10.5)	
other cause	2 (5.7)	0	
no engagement of the fetal head	0	3 (15.8)	
Cervix dilatation when cesarean section (y, mean ± sd)	2 ± 2	6 ± 2	0.000
Length : delivery room until delivery (min) (y, mean ± sd)	314 ± 252	242 ± 175	0.034
	N = 46	N = 136	

Cesarean before labor excluded			
Epidural anesthesia	36 (78.3)	102 (75)	0.655
Clear amniotic fluid	35 (76.1)	118 (86.8)	0.162
Maternal fever	2 (4.4)	5 (3.7)	0.84
Tachycardia	11 (23.9)	15 (11)	0.03
FHR anomalies during labor	28 (60.9)	93 (69)	0.318
antibiotics during labor	41 (89.1)	115 (84.6)	0.44
Oxytocin during labor	31 (67.4)	63 (46.3)	0.013

Table 3: Neonatal morbidity and mortality

	Induced labor	Spontaneous labor	P
	N = 64	N = 136	
	n (%)	n (%)	
Composite neonatal morbidity	3 (4.7)	7 (5.2)	0.889
Neonatal deaths	1 (1.56)	3 (2.2)	0.76
Long bones fracture	0	1 (0.74)	0.492
Brachial plexus injuries	0	0	
5-min Apgar < 4	3 (4.7)	3 (2.2)	0.337
Moderate or severe encephalopathy	1 (1.56)	0	0.144
Convulsions	0	0	
IVH 3-4	1 (1.56)	1 (0.74)	0.583
Necrotizing enterocolitis 2-3	0	2 (1.47)	0.33
pH			
pH \leq 7,10	4	3	0.147
Ventilation			
Intubation	15 (23.4)	23 (16.9)	0.27
Ventilation > 24h in the 72 1st hours	25 (39.1)	49 (36)	0.68
pneumothorax	0	1 (0.74)	0.492
Early-onset bacterial infection	4 (6.25)	12 (8.8)	0.531
Sex			0.23
Male	35 (54.7)	62 (45.6)	
Female	29 (45.3)	74 (54.4)	
Birth weight (y, mean \pm sd)	1889 \pm 534	2054 \pm 575	0.054
< 1000	1 (1.56)	1 (0.7)	0.319
[1000-1500[	19 (29.7)	28 (20.6)	
[1500-2000[	19 (29.7)	33 (24.3)	
[2000-2500[	14 (21.9)	40 (29.4)	

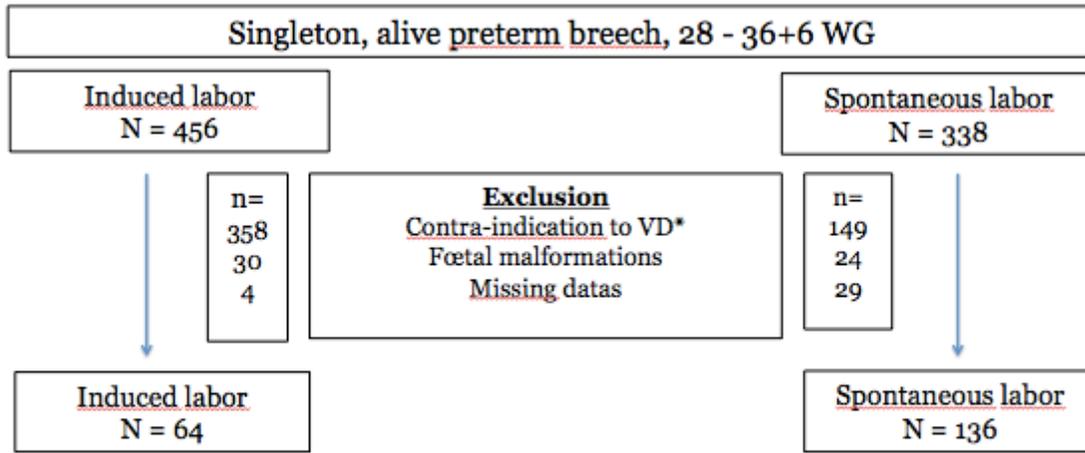
≥ 2500	11 (17.2)	34 (25)	
Birth weight < 10th percentile	32 (50)	5 (3.7)	0.000

Table 4: Maternal morbidity

	Induced labor	Spontaneous labor	P
	N = 64	N = 136	
	n (%)	n (%)	
Maternal morbidity			
Maternal death	0	0	
Uterine rupture	0	0	
accreta	0	2*	
Postpartum hemorrhage ≥500cc	2 (3.1)	5 (3.7)	0.843
Transfusion	3 (4.7)	0	0.011
Uterine padding	0	0	
Hysterectomy	0	0	
Sulprostone	2 (3.13)	4 (2.9)	0.943
Uterine tamponade	0	0	
Secondary surgery	0	0	
Endometritis	0	1 (0.74)	0.492

*unknown, discovered during delivery and confirmed by the anatomopathological examination

Figures



*abnormal placenta implantation, multiple scared uterus, maternal disease, cephalopelvic disproportion, emergency situations (severe fetal heart rate abnormalities, severe pre-eclampsia, HELLP, important bleeding, cord prolaps)

Figure 1

Flow Chart