Risk Factors and Maternal-Fetal Outcomes of Pregnant with Preeclampsia Who Converted to Cesarean Section After A Trial Vaginal Birth

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Abstract

Background: At present, most pregnant with preeclampsia choose direct cesarean section. Whether cesarean section after vaginal trial affects the outcome of mother and child and its related risk factorsIt are still unclear. The purpose of this study is to investigate the risk factors and maternal-neonatal outcomes in severe preeclampsia patients who undergo transfer-cesarean section during vaginal labor.

Methods: For this retrospective study, patient with severe preeclampsia data from 2015 to 2019 was collected. Study participants were women with severe preeclampsia having a cesarean section during week 34 and 41 of gestation.The population was classified into three groups: patients with severe preeclampsia had cesarean section directly, patients with severe preeclampsia had vaginal deliveries and patients with severe preeclampsia who sufferred from transfer-cesarean section in the vaginal labor. The demographic variables and maternal-fetal outcomes were collected and analyzed.

Results: (1) 34%(553/1626) severe preeclampsia had labor induction or natural labor and the ratio of transfer-cesarean section after trial of labor was 39% (216/553) . (2)There was a greater incidence of postpartum haemorrhage (7.7% versus 4.5%),the need for blood transfusion (2.4% versus 0.6%) and more than 7 days of hospitalization (10.4% versus 0.6%) in patients submitted to direct caesarean section compared with vaginal delivery.Apgar score at 5 min <7score and admission of NICU (7.5% versus 2.7%;26.0% versus 18.4%) in the neonates were significantly higher in the direct cesarean section group compared with vaginal delivery,but no difference between direct cesarean section group and transfer cesarean section.(3)When multiple logistic regression analysis was performed,the variables that remained significantly associated with transfer cesarean section were cephalopelvic disproportion (OR ¼ 2.13; 95% CI: 1.43–8.13) and fetal distress (OR ¼ 2.42; 95% CI: 1.76–6.65).

Conclusion: Vaginal delivery can be recommended to pregnants with severe preeclampsia as long as there are no contraindications for vaginal delivery. Attempting but failing vaginal delivery would not increase the complications of mother and neonates,but fetal monitoring and labor evaluation should be strengthen during the process of labor.

Background

Preeclampsia complicates 5 to 9% of all pregnancies and is a leading cause of maternal morbidity and mortality[1–3].Although the etiology and progression of preeclampsia is not fully understood, delivery has been demonstrated to be the definitive treatment. The clinician is then faced with the decision of when and how to proceed with delivery. According to the guideline, preeclampsia is not an indication of cesarean section expect with some serious complication. It means that pregnant women with preeclampsia can have a vaginal trial. However, it's report that the cesarean section rate of preeclampsia was significantly higher than normal pregnant women[4, 5].On the one hand, patients suffering from preeclampsia choose cesarean section to terminate the pregnancy at first. On the other hand, preeclampsia patients who choose vaginal birth at begining may undergo transfer cesarean section at

last. Whether cesarean section after vaginal trial affects the outcome of mother and child and its related risk factorsIt are still unclear.

Therefore, the first objective of this study was to explore the risk factors for pregnant with preeclampsia who had planned vaginal delivery have to undergo transfer cesarean section at last.The second objective was to evaluate maternal and neonatal outcomes for these kind of pregnants.The final aim of this study was to determine the most favorable delivery for patients with severe preeclampsia.

Materials And Methods

Patient data were collected from Fujian Provincial Maternity and Children's Hospital from January 1st, 2015 to July 31st, 2019. Elective cesarean section was defined as a planned operative termination of pregnancy before labor.Emergency cesarean section was defined as urgent cesarean section before labor started.Transfer -cesarean section was defined as cesarean section after labor started.Patients with a single,cephalic pregnancy that was complicated preeclampsia between 34 and 41 weeks gestation were classified into three groups:patients with severe preeclampsia had cesarean section directly,patients with severe preeclampsia who had vaginal deliveries and patients with severe preeclampsia who sufferred from transfer cesarean section in the vaginal labor.

Criteria defined by the National High Blood Pressure Education Program Working Group (2000) were taken into consideration for the diagnosis of severe preeclampsia, i.e.presence of any one of the following signs or symptoms in women with hypertension diagnosed after 20 weeks of pregnancy and proteinuria: blood pressure 160 mmHg systolic or 110 mmHg diastolic; proteinuria 2.0 g in 24 h (2 + or 3 + on qualitative examination); increased serum creatinine level (41.2 mg/dL); platelet count 5100 000 cells/mm3, evidence of microangiopathic haemolytic anemia (with increased lactic acid dehydrogenase concentration), or both; elevated hepatic enzyme activities (either alanine aminotransferase, aspartate aminotransferase, or both); patient report of persistent headache or other cerebral or visual disturbances; patient report of persistent epigastric pain[6].

Bivariate analyses were performed using X^2 and Fisher's exact tests to compare categorical data. Student's t-tests, Mann–Whitney U, and Kruskall–Wallis tests were used to compare parametric and nonparametric data, where appropriate. Mantel–Haenszel estimates were used to test for effect modification.

Logistic regression was used to estimate odds ratios, and multivariable modeling was used to adjust for potential confounding factors. In building our multivariable model, we included risk factors with an association with the dependent variable at a level of $P < 0.2$. The risk factors were evaluated to be confounders or effect modifiers of the association between vaginal delivery and transfer cesarean section. Using backward stepwise elimination, we created our final parsimonious model. Risk factors were retained in the model as a confounder if the effect size was at least 10% or if there was a significant

interaction (P < 0.05). Bootstrap resampling was performed to assure stability of our models and tests of statistical significance.

All data were analyzed using SPSS version 19.0. Statistical significance of P < 0.05 was used.

Results

During the study period, 1626 were complicated by severe preeclampsia (2.5%). 796 of the 1626 had an selective cesarean section, 277 accept emergency cesarean section and 553(34%) had labor induction or natural labor. Of those with labor induction or natural labor, 337 (61%) were delivered vaginally and 216 (39%) sufferred from transfer-cesarean section at last. In patients having selective and emergency cesarean section, the most frequently charted indications were pregnant request and nonreassuring non-stress test of fetal. For those delivered by transfer -cesarean section after labor induction or natural labor,cephalopelvic disproportion (59%) and fetal distress (32%) were most commonly indiction.

There were no statistical differences in basic demographic characteristics among each group(Tables 1).There was a greater incidence of postpartum haemorrhage,the need for blood transfusion and more than 7 days of hospitalization in patients submitted to direct caesarean section compared with vaginal delivery(Table 2).Apgar score at 5 min < 7 score and admission of NICU in the neonates were significantly higher in the emergency cesarean section group(Table 3).

Table 1
Comparison of demographic variables in each group

	Direct cesarean section (n = 1073)	Vaginal delivery (n = 337)	Transfer-cesarean section (n = 216)	P
Maternal age (y)	26.4 ± 6.6	27.7 ± 7.3	25.9 ± 6.5	NS
Gestational age (wk)	36.6 ± 4.8	37.4 ± 7.3	37.0 ± 6.9	NS
Gravidity	2.18	2.98	2.46	NS
Parity	0.89	1.23	1.33	NS
BMI (kg/m2)	26.5 ± 3.7	27.6 ± 6.1	27.1 ± 4.4	NS
SBP on admission (mmHg)	166 ± 21.4	155 ± 24.2	166 ± 21.4	NS
DBP on admission (mmHg)	105 ± 15.7	102 ± 13.9	111 ± 17.6	NS
Fetal birth weight (g)	2450 ± 58.2	2511 ± 61.7	2578 ± 64.3	NS
BMI, body mass index;				
SBP, systolic blood pressure; DBP, diastolic blood pressure.				
NS, Not significant.				

Table 2
Comparison of maternal complications in each group

	Direct cesarean section (n = 1073)	**Vaginal delivery (n = 337)**	**Transfer-cesarean section (n = 216)**
Estimated blood loss (mL)	724 ± 112.5	208 ± 32.7	708 ± 95.1
Postpartum haemorrhage(n,%)	(83,7.7%)	(15,4.5%)	(16,7.2%)
Blood transfusion(n,%)	(26,2.4%)	(2,1.0.6%)	(4,1.9%)
Eclampsia(n,%)	(1,0.09%)	(0,0%)	(0,0%)
Hypertensive crisis(n,%)	(15,1.4%)	(2,0.6%)	(4,1.9%)
HELLP syndrome(n,%)	(6,0.56%)	(1,0.30%)	(2,0.938%)
Placenta abruption(n,%)	(31,2.9%)	(7,2.1%)	(8,3.6%)
Thromboembolic disease(n,%)	(2,0.18%)	(0,0%)	(1,0.46%)
Any puerperal infection(n,%)	(3,0.28%)	(0,0%)	(2,0.93%)
> 7 d of hospitalization(n,%)	(112,10.4%)	(2,0.6%)	(26,12.0%)

Table 3 Neonatal complications in each group

	Direct cesarean section (n=1073)	Vaginal delivery (n=337)	Transfer-cesarean section (n=216)
Apgar score at 1 min <7* (n,%)	(109,10.2%)	(39,11.6%)	(28,12.8%)
Apgar score at 5 min <7* (n,%)	(81,7.5%)	(9,2.7%)	(11,5.1%)
NICU(n,%)	(279,26.0%)	(62,18.4%)	(45,21.0%)
Mortality(n,%)	(1,0.09%)	(0,0%)	(0,0%)

*No. of deliveries

To better compare the results of neonates, the neonates at ≧ 37 weeks were compared (Table 4). The neonates were similar weight and age in each groups. Apgar score at 1 min < 7* and admission of NICU were significantly more common in the neonates delivered by transfer-cesarean section(Table 4).

Table 4
Comparison of neonatal complications in each group (≧ 37 weeks)

	Direct cesarean section (n = 647)	Vaginal delivery (n = 263)	Transfer-cesarean section (n = 175)
Gestational age (wk)	37.3 ± 5.4	37.9 ± 3.6	38.4 ± 4.4
Birth weight (g)	2767 ± 63.4	3058 ± 61.7	3117 ± 61.9
Apgar score at 1 min < 7* (n,%)	(61,9.4%)	(22,8.4%)	(24,13.7%)
Apgar score at 5 min < 7* (n,%)	(49,7.6%)	(5,1.9%)	(10,5.7%)
NICU(n,%)	(81,12.5%)	(12,4.6%)	(37,21.1%)
Mortality(n,%)	(0,0%)	(0,0%)	(0,0%)
*No. of deliveries			

When multiple logistic regression analysis was performed,the variables that remained significantly associated with transfer cesarean section were cephalopelvic disproportion (OR ¼ 2.13; 95% CI: 1.43–8.13) and fetal distress (OR ¼ 2.42; 95% CI: 1.76–6.65) (Table 5).

Table 5
Risk factors for transfer-cesarean section(multivariate analysis)

	Coefficient	Standard error	P	OR	95%CI
cephalopelvic disproportion	1.41	0.37	0.0018	2.13	1.43–8.13
Fetal distress	1.22	0.29	0.0052	2.42	1.76–6.65
Variables entering the model: maternal age, parity,body mass index,gestational age at delivery, induced labour, spontaneous labour,hypertensive crisis,placenta abruption, length of labor, abnormal labor,cephalopelvic disproportion,pregnant request,fetal condition.					
OR, odds ratio; CI, confidence interval.					

Discussion

The influence of transfer-cesarean section to mother and neonates

Termination of pregnancy is the only cure for preeclampsia.Caesarean sections were associated with increased maternal morbidity, raising the risk of haemorrhagic and infectious complications and the rate of postpartum hypertensive crises,and prolonged hospitalization[7-9].Thus,To pregnant with severe preeclampsia,guidelines and medical literature support vaginal delivery if there is no other indication of

caesarean sections[10-12].However,the decision regarding mode of delivery is not easy, obstetricians and pregnants often worry about that the maternal and fetal'clinical conditions will worsen during vaginal delivery.Thus,many patients and doctors choose cesarean section directly in clinical.In the present study, a high direct caesarean section rate of almost 66% was found in patients with severe preeclampsia.

There were no statistical differences in basic demographic characteristics among patients with severe preeclampsia had direct cesarean section,patients with severe preeclampsia who had vaginal delivery and patients with severe preeclampsia who sufferred from transfer-cesarean section in the vaginal labor.An increased risk of various postpartum complications was found in patients submitted to direct caesarean section.Estimated blood loss was almost 3 times higher in patients submitted to direct caesarean section compared with vaginal delivery,and similar with transfer caesarean section.There was a greater incidence of postpartum haemorrhage (7.7% versus 4.5%),the need for blood transfusion (2.4% versus 0.6%) and more than 7 days of hospitalization (10.4% versus 0.6%) in patients submitted to direct caesarean section compared with vaginal delivery.Apgar score at 5 min <7score and admission of NICU (7.5% versus 2.7%;26.0% versus 18.4%) in the neonates were significantly higher in the direct cesarean section group compared with vaginal delivery,but no difference between direct cesarean section group and transfer cesarean section.

Our data do not support that direct cesarean delivery is beneficial to mother and neonates. In our study,multiple maternal and neonatal complications were increased in the direct cesarean section group. However there was no difference between direct and transfer-cesarean section group. This agrees with the study by Alanis et al[13],which showed an increase in the incidence of respiratory distress syndrome in newborns delivered by cesarean section. The finding more explicit strengthens the recommendation to attempt vaginal delivery in pregnant of severe preeclampsia since it is often successful and may reduce the risks of complications if delivery is vaginal but would not increase the incidenc of complications no matter in mother but also in neonates even conversion to cesarean section in vaginal labor.

Risk factors of transfer-cesarean section

Alexander etal[14]reviewed 278 singleton women with severe preeclampsia at Parkland Hospital. In half of the women, labor was induced, and the remainder underwent cesarean delivery without labor.Induction was successful in accomplishing vaginal delivery in a third. Others have reported similar observations (Roland, 2017)[15]. Unfortunately, none of these studies further analyzed the failure causes of vaginal trial.When multiple logistic regression analysis was performed,this study got that cephalopelvic disproportion(OR ¼ 2.13; 95% CI: 1.43-8.13) and fetal distress (OR¼2.42; 95% CI: 1.76-6.65) remained significantly associated with transfer-cesarean section,which is consistent with the risk factors of conversion to cesarean section during vaginal delivery in normal pregnant.And it can alleviate the anxiety of obstetricians and pregnants that the maternal and fetal'preeclampsia conditions would worsen during vaginal delivery in some extent .

How to reduce the rate of transfer-cesarean section and improve the outcome of mother and neonates

According to this study and based on the present findings together with other studies[16-18], we would suggest that, in addition to permitting labour to progress when there are spontaneous contractions,labour can be induced in pregnant of severe preeclampsia with an indication to terminal the pregnancy, as long as there are no contraindications for vaginal delivery. Attempting but failing vaginal delivery would not increase the complications of mother and neonates but fetal monitoring and labor evaluation should be strengthen during the process of labor.

We acknowledge that this is an observational, cohort study,the level of evidence presented here is not as strong as that of a randomized clinical trial.However, the consistency of our epidemiologic data with other larger studies previously published is reassuring.We recommend a trial labor for all pregnant with severe preeclampsia unless it is excluded for obstetric indications.

Abbreviations

BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure; OR: odds ratio; CI: confidence interval.

Declarations

Ethical approval: Ethical approval was obtained from the Fujian Provincial Maternity and Children's Hospital Ethics Committee (2006).

Consent for publication: Not applicable

Availability of data and materials: The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

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