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Clinical Significance of Deliveries With Uterine Fundal Pressure Maneuver at a Single Perinatal Center in Japan

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Abstract

Background: We examined the patient characteristics and obstetrical outcomes of deliveries with uterine fundal pressure maneuver (UFPM) to identify their clinical significance at a single perinatal center in Japan.

Methods: Subjects were women with vertex singleton pregnancy who delivered at Japanese Red Cross Katsushika Maternity Hospital between April 2008 and September 2012.

Results: A total of 6,317 cases were evaluated for the statistical analyses. Of these, UFPM was performed in 634 cases (10.0%). Using multiple logistic regression, UFPM was independently associated with nulliparity ($P < 0.001$), presence of oligohydramnios ($P = 0.023$), non-reassuring fetal status ($P < 0.001$), oxytocin use ($P < 0.001$), vacuum extraction ($P < 0.001$), Cesarean delivery ($P = 0.021$), postpartum hemorrhage ($P < 0.001$), mid-lateral episiotomy ($P < 0.001$), third-degree perineal laceration ($P = 0.0042$) and cervical laceration ($P = 0.022$).

Conclusion: UFPM remains a controversial maneuver. Therefore, the physician should make the decision about the appropriate use of UFPM based on the patient's individual clinical circumstances.

Keywords: Uterine fundal pressure maneuver; Perinatal outcomes; Japan

Introduction

It has been advised by some authors that uterine fundal pressure maneuver (UFPM) be applied with a steady, gentle pressure with one open hand on the fundus of the uterus at a 30° to 40° angle to the maternal spine in the direction of the cervix during the second stage of labor [1]. UFPM has been performed to assist the terminal phase of vaginal delivery through increasing the intrauterine pressure [1, 2]; however it has been a controversial maneuver. UFPM applied under well-controlled condition significantly increases intrauterine pressure in some, but not all women, and it has been supposed to be able to avoid unnecessary or delayed operative intervention [2]. However, some recent reviews have documented that no confirmed beneficial or harmful effects of use of UFPM [1, 3]. In these reviews, in addition, there has been insufficient evidence regarding safety of UFPM for the baby although the adverse influences on the maternal perineum have been inconclusive [1, 3]. However, some case reports have investigated adverse events associated with inadequate use of the maneuver such as uterine rupture [4, 5], rib rupture [6], anal sphincter tears [7] and amniotic fluid embolism [8]. The reasons leading these events are unclear, because some authors have thought that other factors than UFPM such as episiotomy and vacuum extraction are associated with these adverse events [1, 3, 9, 10]. Therefore, the prognosis of deliveries with UFPM has been attributed to a variety of other factors than UFPM.

In this study, therefore, we examined the patient characteristics and obstetrical outcomes of deliveries with UFPM to identify their clinical significance at our hospital: Japanese Red Cross Katsushika Maternity hospital, one of perinatal center in Tokyo, Japan.

Methods

The protocol for this study was approved by the Ethics Committee of the Japanese Red Cross Katsushika Maternity Hospital.

Subjects were women with vertex singleton pregnancy who delivered at Japanese Red Cross Katsushika Maternity Hospital between April 2008 and September 2012. In this study, cases of intrauterine fetal demise, cases of Cesarean deliveries before onset of labor pains or during the first stage

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Table 1. Analysis of Dichotomous Variables of Characteristics and Perinatal Outcomes by Uterine Fundal Pressure Maneuver in Cases Singleton Vertex Delivery

Uterine fundal pressure	(-)	(+)	P-value	Crude odds ratio	95% confidence interval
Number	5,683	634			
Maternal age ≥ 35 years	1,840 (32.4)	233 (36.8)	0.026	1.21	1.0 - 1.4
Nulliparity	2,740 (48.2)	524 (82.6)	< 0.001	5.12	4.1 - 6.3
Gestational age at delivery					
≤ 36 weeks	317 (5.6)	35 (5.5)	0.68	1.08	0.75 - 1.6
37 - 40 weeks	4,698 (82.7)	481 (75.9)	Ref.	1	
≥ 41 weeks	668 (11.8)	118 (18.6)	< 0.001	1.73	1.4 - 2.1
Pregnancy induced hypertension	265 (4.7)	48 (7.6)	0.0013	1.67	1.2 - 2.3
Gestational diabetes mellitus	106 (1.9)	16 (2.5)	0.25	1.36	0.80 - 2.3
Oligohydramnios	371 (6.5)	64 (10.1)	< 0.001	1.61	1.2 - 2.1
Non-reassuring fetal status	353 (6.3)	214 (33.8)	< 0.001	7.58	6.2 - 9.2
Oxytocin use	1,008 (17.7)	289 (14.0)	< 0.001	3.89	3.3 - 4.6
Delivery modes					
Normal delivery	5,389 (94.8)	287 (45.3)	Ref.	1	
Vacuum extraction	287 (5.1)	339 (53.4)	< 0.001	22.2	18 - 27
Foeceps delivery	1 (0.0)	0 (0)	0.82	0	
Cesarean section	6 (0.1)	8 (1.3)	< 0.001	25.0	8.6 - 73
Shoulder dystocia	2 (0.0)	0 (0)	0.64	0	
Neonatal birth weight					
< 2,500 g	574 (10.1)	55 (8.7)	0.31	0.86	0.64 - 1.2
2,500 - 3,499 g	4,546 (80.0)	506 (79.8)	Ref.	1	
≥ 3,500 g	563 (9.9)	73 (11.5)	0.25	1.16	0.90 - 1.5
Apgar score < 7					
at 1 minute	59 (1.0)	20 (3.2)	< 0.001	3.10	1.9 - 5.2
at 5 minute	5 (0.1)	1 (0.2)	0.59	1.79	0.21 - 15
Umbilical artery pH					
< 7.0	13 (0.2)	4 (0.6)	0.064	2.77	0.90 - 8.5
< 7.1	86 (1.5)	27 (4.3)	< 0.001	2.88	1.9 - 4.5
Neonatal intensive care units admission	231 (4.1)	41 (6.5)	0.0053	1.62	1.2 - 2.3
Postpartum hemorrhage ≥ 1,000 mL	345 (6.1)	81 (12.8)	< 0.001	2.27	1.8 - 2.9
Episiotomy					
None	4,057 (71.4)	59 (9.3)	Ref.	1	
Mid-lateral episiotomy	1,370 (24.1)	553 (87.2)	< 0.001	27.7	21 - 37
Midline episiotomy	256 (4.5)	22 (3.5)	< 0.001	5.91	3.6 - 9.8
Perineal laceration					
Non - second degree	5,587 (98.3)	591 (93.2)	Ref.	1	
Third degree	82 (1.4)	34 (5.4)	< 0.001	3.91	2.6 - 5.9
Forth degree	14 (0.2)	9 (1.4)	< 0.001	6.08	2.6 - 5.9
Cervical laceration	75 (1.3)	33 (5.2)	< 0.001	4.11	2.7 - 14

Table 2. Adjusted Odds Ratios and 95% Confidence Intervals Associated With Uterine Fundal Pressure Maneuver Using Logistic Multivariable Regression Analysis

	P-value	Adjusted odds ratio	95% confidence interval
Maternal age ≥ 35 years	0.12	1.15	0.96 - 1.4
Nulliparity	< 0.001	2.55	2.0 - 3.2
Gestational age at delivery ≥ 41 weeks	0.13	1.19	0.95 - 1.5
Pregnancy induced hypertension	0.081	1.36	0.96 - 1.9
Oligohydramnios	0.023	1.41	1.1 - 1.9
Non-reassuring fetal status	< 0.001	4.12	3.3 - 5.2
Oxytocin use	< 0.001	1.47	1.2 - 1.8
Delivery modes			
Vacuum extraction	< 0.001	10.4	8.3 - 13
Cesarean section	0.021	4.44	1.1 - 18
Apgar score < 7 at 1 minute	0.23	1.51	0.77 - 3.0
Umbilical artery pH < 7.1	0.19	1.56	0.80 - 3.1
Neonatal intensive care units admission	0.13	1.33	0.92 - 1.91
Postpartum hemorrhage ≥ 1,000 mL	0.018	1.45	1.1 - 2.0
Episiotomy			
Mid-lateral episiotomy	< 0.001	7.88	6.2 - 10
Midline episiotomy	0.16	1.60	0.82 - 3.1
Perineal laceration			
Third degree	0.0042	2.10	1.3 - 3.5
Forth degree	0.073	2.66	0.87 - 8.1
Cervical laceration	0.022	1.86	1.1 - 3.2

of labor, cases of previous Cesarean deliveries and cases with severe maternal chronic heart disease were excluded. Data collected from delivery records included: patient's age, parity, maternal complications such as pregnancy induced hypertension (PIH) and gestational diabetes mellitus (GDM), presence or absence of oligohydramnios (amniotic fluid index < 5 cm), gestational age at delivery, use of intravenous oxytocin, delivery modes, neonatal birth weight, neonatal Apgar score at 1 and 5 minutes, umbilical artery pH, shoulder dystocia, admission of neonatal intensive care units (NICU), third- or fourth-degree perineal laceration, presence or absence of cervical laceration, postpartum hemorrhage.

Pregnancy-induced hypertension was defined as blood pressure ≥ 140/90 mmHg measured on two or more occasions at least six hours apart with the patient at rest. A 75-g 2-hour oral glucose tolerance test was performed to diagnose gestational diabetes according to the Japan Society of Obstetrics and Gynecology. Gestational diabetes was defined as plasma glucose level meeting one of the following criteria: ≥ 92 mg/dL while fasting, ≥ 180 mg/dL after 1 hour, or ≥ 153 mg/dL after 2 hours. The fetus was considered to be as 'non-reassuring fetal status (NRFS)' if repeated late or severe variable deceleration (< 60 beats/minute and ≥ 60 seconds) and/or prolonged decelerations (< 100 beats/minute and ≥ 5

minutes) occurred.

In our hospital, UFPM is always performed by an obstetrician, and all the maneuvers were documented by the nursing staff. The UFPM during pushing stage of labor is performed with careful maternal observation and fetal heart rate monitoring.

Cases and controls were compared by the x^2 or Fisher's exact test for categorical variables. Odds ratios (ORs) and 95% confidence intervals (CIs) were also calculated. Differences with $P < 0.05$ were considered significant. Variables used in the multivariate model were those that on univariate analysis had shown significance toward association with UFPM. Logistic regression was then performed to identify the factors most strongly associated with UFPM in a multivariate model.

Results

A total of 6317 cases were evaluated for the statistical analyses. Of these, UFPM was performed in 634 cases (10.0%).

Table 1 shows the analysis of dichotomous variables of characteristics and perinatal outcomes by UFPM in cases singleton vertex delivery.

Using multiple logistic regression, UFPM was independently associated with nulliparity ($P < 0.001$), presence of oligohydramnios ($P = 0.023$), non-reassuring fetal status ($P < 0.001$), oxytocin use ($P < 0.001$), vacuum extraction ($P < 0.001$), Cesarean delivery ($P = 0.021$), postpartum hemorrhage ($P < 0.001$), mid-lateral episiotomy ($P < 0.001$), third-degree perineal laceration ($P = 0.0042$) and cervical laceration ($P = 0.022$) as shown in Table 2.

Discussion

The major findings of this study in our institute are as follows: (1) in our institution, MFPM was performed in cases of difficult delivery such as cases of nulliparous women, cases with oligohydramnios, cases requiring augmentation with oxytocin and cases complicated by non-reassuring fetal status, (2) UFPM was used mainly as an adjunct to vacuum extraction in cases of NRFS; alternatively, vacuum extraction or Caesarean section has been sometimes performed for emergency cases of failed UFPM, and (3) UFPM was not associated with neonatal adverse outcomes, while it was associated with an increased risk of maternal complications.

To date, some literature reviews have revealed their relatively limited data exist on the subject of the safety and/or efficacy of UFPM [1, 3]. In addition, there are no committee opinions supporting the use of UFPM in vaginal delivery by the American College of Obstetricians and Gynecologists (ACOG) [1] or Japan Society of Obstetrics and Gynecology [11]. The maneuver seems to be performed in many institutions in the world; however there is previously no data published investigating the prevalence of the UFPM in the second stage of labor. One reason may be that the documentation of such technique is often missing from medical records. The other reason may be the difference in physicians' setting and/or awareness. In addition, it is very difficult to describe a standard technique because the application of such a method that a lot of variation by its nature [12]. The prevalence of UFPM in vaginal delivery which was 10.0%, which was differ from that in one previous small study reported in Japan (5.9%, $P < 0.001$) [10]. One reason may be a larger sample size of this study. The other reason may be that in our institution vacuum extraction is used for most cases of immediate delivery, and UFPM is frequently used for its adjunct compared with those in their institute [10]. Therefore, a further study may be needed under the same indications and/or conditions for UFPM.

In our institute, UFPM has been mainly performed in cases of NRFS. Furthermore, the most frequent indications have been reported to be a non-reassuring fetal heart rate and maternal exhaustion; however fetal risks of MFPM has been also reported to include an increase in fetal intracranial pressure leading to non-reassuring fetal heart rate patterns, umbilical cord compressions and hypoxemia [13]. The increases in intrauterine pressure and/or intracranial pressure have been speculated by some authors to cause a decrease in fetal cerebral blood flow those might be related to fetal brain complications [13]. In this study, the use of UFPM did not seem to be associated with neonatal complications; however it may be associated with maternal complications such as postpartum hemorrhage, severe perinatal lacerations and cervical lacerations. The association between UFPM and maternal complications are also controversial, because the nulliparity, episiotomy, oxytocin use and vacuum extraction have been also reported to be independent risk factors for maternal adverse outcomes after vaginal delivery [1, 9, 10, 14]. Therefore, in these aspects a further prospective examination may be needed to clarify the influence of UFPM on maternal and/or fetal outcomes, too.

UFPM remains a controversial maneuver. Therefore, the physician should make the decision about the appropriate use of UFPM based on the patient's individual clinical circumstances.

Declaration of Interest

The authors report no conflicts of interest.

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