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Original Article

Safety of uterine fundal pressure maneuver during second stage of labor in a tertiary perinatal medical center: A retrospective observational study



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ABSTRACT

Objective: This study aimed to evaluate the conformity of the indications and implementation status of uterine fundal pressure maneuver (UFP) and to examine its safety according to the Japan Society of Obstetrics and Gynecology (JSOG) guidelines.

Materials and methods: We selected all the patients ($n = 265$) who were treated with UFP between January 2015 and March 2017. We first evaluated the conformity of the indications and implementation status of UFP concerning the guidelines for obstetrical practice in Japan, 2017. Second, we retrospectively examined maternal and fetal adverse events (AEs) to determine the safety of UFP.

Results: In total, 265 patients underwent UFP; of all the UFP-assisted deliveries, 189 patients (72%) were evaluated for conformity. Of these 189 patients, 181 (95.7%) were confirmed to be compliant. Laceration of the birth canal was the most frequently occurring maternal AE, followed by cervical laceration. No cases of uterine rupture, severe AEs leading to an extended hospital stay, and maternal deaths were observed. Although fetal AEs requiring admission to neonatal intensive care unit (NICU) were recorded for 33 patients (12.5%), all newborns developed normally without sequela.

Conclusion: The findings of this study may support the validity of the 2017 guidelines. Because it is difficult to find evidence of the safety of use of UFP, it is essential to accumulate experiences and results learned in clinical practice to build a consensus in the future using the current 2017 guidelines as a standard as done in the current study.

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Introduction

Uterine fundal pressure maneuver (UFP) is widely performed during the second stage of labor to expedite delivery or to increase the expulsive force of the uterus in situations requiring urgent delivery, either alone or in combination with other methods such as vacuum extraction and forceps delivery [1]. The efficacy of UFP is widely recognized empirically. A large-scale study in Japan showed that 11.4% of the total vaginal deliveries are performed with UFP in 89.4% of the perinatal care hospitals [2].

While UFP reportedly decreases the duration of the second stage of the labor of a primipara, various adverse events (AEs), such as maternal rib fracture, laceration of the birth canal, and amniotic fluid embolism, have also been reported [3–6]. In Japan, the Japan Society of Obstetrics and Gynecology (JSOG) issued guidelines about the indications and procedures for UFP in 2017 [7]. However, because these processes and indications of UFP differ from one facility to another, the number of clinical studies conducted to validate its effectiveness and risks are insufficient; as a result, the effect of UFP on mothers and fetuses remains controversial [8].

The purpose of this study was to evaluate the conformity of the indications and implementation status of UFP performed during the second stage of labor at our tertiary perinatal medical center and to examine its safety for mothers and fetuses according to the JSOG guidelines [7].

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Materials and methods

A retrospective observational study was conducted using medical records of patients who delivered babies at the Department of Obstetrics and Gynecology, Toho University Omori Medical Center between January 2015 and March 2017. Our hospital is a tertiary perinatal medical center located in Southwest Tokyo; approximately 1000 pregnancy cases are handled per year at our hospital, including low- and high-risk pregnancies. UFPM is indicated for only those patients who require expedited delivery during the second stage of labor. It is used either in combination when assisting vacuum extraction or is performed when the leading portion of the fetus is descending to station +4 or more, and the expulsive force needs to be increased because of maternal fatigue or failure to progress. Cesarean section is also performed in cases when the presentation of the fetus is other than head presentation and when cephalopelvic disproportion is suspected. At our hospital, epidural anesthesia is not administered for vaginal delivery. When performing UFPM, we strictly follow the following fundamental principles (Fig. 1): (1) only obstetricians can perform UFPM; (2) operators should stand by the side of pregnant women; (3) cardiotocography (CTG) should be continuously monitored for all patients; (4) UFPM should be performed at the time of onset of labor pains; (5) the expulsive force should be increased along the pelvic axis; and (6) the number of trials should be ≤ 5 times and the duration of total trials should be ≤ 20 min. All these conditions conform to the 2017 guidelines [7].

We selected all patients for whom UFPM was employed at our hospital during January 2015 and March 2017. For the study, we first evaluated the conformity of the indications and implementation status of UFPM regarding compliance with the 2017 guidelines [7]. The endpoints included the weeks of gestation, indications, the station of the fetal head, the number of UFPM trials, and the application of UFPM to the first twin. Second, we evaluated maternal/fetal AEs that occurred during delivery using UFPM to

examine the safety of UFPM retrospectively. Maternal AEs were defined as those requiring additional treatment or extended hospital stay (e.g., severe laceration of the birth canal, cervical laceration, uterine rupture, and maternal death). Neonatal AEs were defined as those requiring admission to the NICU. The most recent neurological development was examined.

This study is authorized by the Toho University Omori Medical Center Ethics Committee (M17226).

Results

The study patients' profiles are summarized in Fig. 2. In total, 2294 deliveries were performed during the study period. Of these, 366 (16%) patients underwent an elective C-section and 1928 (84%) opted for vaginal delivery. During the second stage of labor, UFPM was used for 265 of 1928 (14%) patients, 93 of whom had a vaginal delivery with UFPM, and 170 of whom had a vacuum-assisted delivery with UFPM. Two patients had to undergo C-section because they could not deliver even after five trials of UFPM.

Patients' characteristics are summarized in Table 1. A tendency of performing UFPM more often for primiparas [215 primiparas (82%) vs. 48 multiparas (18%)] was noted. Regarding the gestational weeks at delivery, 240 (91%) and 19 (7%) mothers received UFPM during their full term (37–41 weeks) and the late preterm (34–36 weeks), respectively. Four patients (2%) received UFPM at <34 weeks of gestation. Regarding newborn's weight, 26 (10%) and 29 (11%) newborns weighed ≥ 3500 g and <2500 g, respectively. Eight patients with twin fetuses (3%) also received UFPM.

The indications of UFPM are summarized in Table 2. UFPM was performed because of non-reassuring fetal status (NRFS) in 163 patients (62%) and due to prolonged second stage of labor in 86 patients (33%).

The practical usages of UFPM are summarized in Table 3. Regarding the station of the fetal head, UFPM was performed for 160 patients with the station more than +4 (61%). For 71 patients



Fig. 1. An obstetrician stands by the side of the patient and performs UFPM at the time of onset of labor pains and along the pelvic axis, with the cardiotocography (CTG) is continuously monitored.

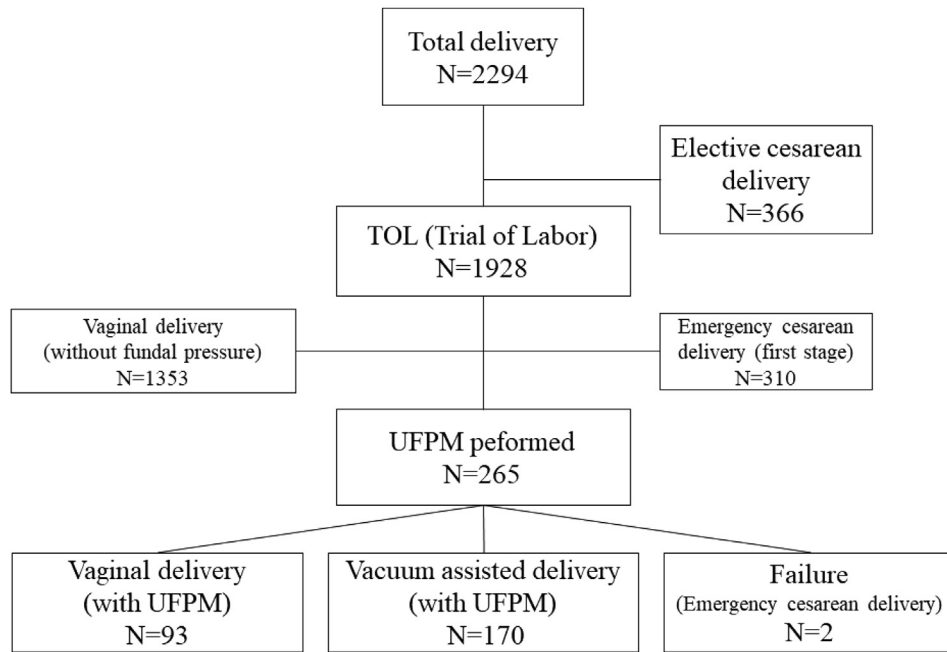


Fig. 2. Patients' profile.

Table 1
Patients characteristics.

	Vaginal delivery (N = 93) N (%)	Vacuum-assisted delivery (N = 170) N (%)	Total (N = 263) N (%)
Age			
<35	54 (21%)	87 (33%)	141 (54%)
35≤	39 (15%)	83 (32%)	122 (46%)
Parity			
Nulliparous	67 (25%)	148 (56%)	215 (82%)
Multiparous	26 (10%)	22 (8%)	48 (18%)
Gestational age at birth (weeks)			
<34	1 (<1%)	3 (1%)	4 (2%)
34–36	7 (3%)	12 (5%)	19 (7%)
37–41	85 (32%)	155 (59%)	240 (91%)
≥42	0	0	0
Number of fetuses			
Singleton	90 (34%)	165 (63%)	255 (97%)
Twin	3 (1%)	5 (2%)	8 (3%)
	(N = 96)	(N = 175)	(N = 271)
Birthweight (g)			
<2500	9 (3%)	20 (8%)	29 (11%)
2500–2999	34 (13%)	78 (30%)	112 (43%)
3000–3499	38 (14%)	61 (23%)	99 (38%)
≥3500	12 (5%)	14 (5%)	26 (10%)

Table 2
Distribution of indication for uterine fundal pressure maneuver.

	Vaginal delivery (N = 93) N (%)	Vacuum-assisted delivery (N = 170) N (%)	Total (N = 263) N (%)
NRFS (Non-reassuring fetal status)	53 (20%)	110 (42%)	163 (62%)
Prolonged 2nd stage	33 (13%)	53 (20%)	86 (33%)
Non-occiput anterior position	1 (<1%)	4 (2%)	5 (2%)
Shoulder dystocia	1 (<1%)	0	1 (<1%)
Placental abruption	1 (<1%)	0	1 (<1%)
Others	0	3 (1%)	3 (1%)
Unknown	4 (2%)	0	4 (2%)

(29%), data were insufficient. Regarding the number of trials, 142 mothers could deliver with UFPM being performed only once (54%). UFPM was not performed >6 times for any patient.

The conformity of UFPM with the 2017 guidelines [7] is summarized in Table 4. Of all the UFPM-assisted deliveries, 189 patients (72%) were evaluated for conformity. Of these 189 patients, 181 (95.7%) were confirmed to be compliant. The UFPM-assisted deliveries performed without conforming to the guidelines included those with <34 weeks of gestation (4 patients) and those with twins (4 patients, for the first twin).

AEs are summarized in Table 5. Two patients who underwent emergency C-section are included in this result. Laceration of the birth canal was the most frequently occurring maternal AE, followed by cervical laceration. Most of these AEs occurred during vacuum extraction [vacuum-assisted delivery (18 patients) vs. vaginal delivery (3 patients)]. No patients with uterine rupture, severe AEs resulting in extended hospital stay, and maternal deaths were observed. Neonates with AEs requiring admission to neonatal intensive care unit (NICU) were noted for 33 patients (12.5%), half of whom (18/33) were cases of neonatal jaundice. Although two patients with severe neonatal asphyxia, five patients with birth trauma [clavicle fracture (1), intraocular bleeding (1), and cephalohematoma (3)], and three patients with transient tachypnea of newborn were recorded, all the newborns developed normally without sequela as of October 2017.

Table 3

Actual usage situation of uterine fundal pressure maneuver.

	Vaginal delivery (N = 93) N (%)	Vacuum-assisted delivery (N = 170) N (%)	Total (N = 263) N (%)
Fetal station			
<0	0	0	0
+1 to +3	6 (2%)	26 (10%)	32 (12%)
≥+4	68 (26%)	92 (35%)	160 (61%)
Unknown	19 (7%)	52 (20%)	71 (27%)
Number of trials			
1	59 (22%)	83 (32%)	142 (54%)
2	17 (6%)	53 (20%)	70 (27%)
3	10 (4%)	23 (9%)	33 (13%)
4	0	8 (3%)	8 (3%)
5	1 (0.4%)	2 (0.8%)	3 (1%)
≥6	0	0	0
Unknown	6 (2%)	1 (0.4%)	7 (3%)

Table 4

Conformity with the guidelines for obstetrical practice in Japan, 2017 [6].

	Vaginal delivery	Vacuum-assisted delivery	Total
Compatible	68	113	181
Incompatible	3	5	8
Gestational age <34 weeks	1	3	4
Inadequate indication	0	0	0
Fetal station <0	0	0	0
Number of trials >5	0	0	0
1st fetus in twin pregnancy	2	2	4
Unknown	22	52	74

Table 5

Adverse events.

	Vaginal delivery	Vacuum-assisted delivery	Total
Maternal events			
Severe perineal laceration	3	11	14
Cervical laceration	0	7	7
Uterine rupture	0	0	0
Maternal death	0	0	0
Other severe adverse events	0	0	0
Neonatal events			
Cephalohematoma	0	3	3
Neonatal jaundice	2	16	18
Clavicular fracture	0	1	1
Intraocular hemorrhage	0	1	1
Apgar score <7 at 5 min	2	0	2
Transient tachypnea of the newborn	2	1	3
Neonatal death	0	0	0
Others (congenital diseases)	3	2	5

Discussion

Our study provided the following two results. First, we could confirm that the indications and implementation status of the UFPs that were evaluated to be appropriate had remarkably high conformity with the 2017 guidelines [7] with 95.7% compliance. Second, among the maternal and neonatal AEs occurring during delivery with UFP, no AE leading to an extended hospital stay for mothers was noted. Although 33 newborns (12.5%) developed AEs requiring admission to NICU, these newborns were confirmed to grow normally without sequela except for those diagnosed with a congenital anomaly.

We found that the indications and the implementation status of the UFPs that were evaluated to be appropriate showed remarkably high conformity (95.7%) with the 2017 guidelines [7]. According to a survey of UFP at a tertiary perinatal medical center in Japan, UFP was performed at 90.3% of birth institutions [9].

Also, 89.4% of the 1430 birth institutions had reportedly used UFP, which indicates its wide-spread usage in obstetric practice in Japan [10]. However, because the timing of procedure in individual cases and the clinical decision in the selection of procedure depends on the professional experiences and opinions, it is commonly believed that there is a lack of sufficient evidence to support the effectiveness and risks of UFP, as also mentioned in the Cochrane Review, 2017 [8]. With these backgrounds, JSOG developed tentative guidelines [7]. Our hospital principles on UFP conform to these guidelines. Therefore the results of the evaluation of maternal and neonatal AEs observed in this study are believed to be useful in building a consensus on the use of UFP in the future. In cases of twin pregnancy (n = 4) (50%), the guidelines were not followed while performing UFPs for the first twin. In all these four patients, no AE was observed in both first and second twins. Despite the possibility that UFP for the first twin may decrease the placental circulation and worsen the condition of the second

twin, it was reported that UFPMP would not increase AEs of the second twin [11]. Currently, however, no evidence supporting this claim exists. As the Japan Council for Quality Health Care also requests for careful considerations in its recommendations [12], a twin pregnancy is likely to develop NRFS as compared with a single pregnancy, which may result in a higher probability of selecting an expedited delivery [13]. Considering the high probability of low-birth-weight newborn and abnormal rotation, vacuum extraction, and forceps delivery may be difficult [14–16]. Therefore, UFPMP for the first twin can be considered effective for expedited delivery.

Second, among maternal and neonatal AEs occurring during delivery with UFPMP, no AE causing extended hospital stay for mothers was noted. Although 33 newborns (12.5%) developed AEs that required admission to NICU, it was confirmed that they were growing normally without sequela, except for those diagnosed with a congenital anomaly. Delivery with UFPMP is reportedly likely to induce severe perineal laceration, with an incidence rate of 10.9%–28.1% [4–6]. Although the incidence rate of severe laceration of external genitalia was lower than that reported in previous studies, with 7.9% (21/265) in this study, it may not be appropriate to make a simple comparison because indications and actual procedures of UFPMP differ depending on each survey. Moreover, severe maternal AEs such as uterine rupture did not occur in any patient. The incidence rate of these AEs is low and varies over a wide range depending on the study [e.g., uterine rupture (0.015%–1.5%)] [6,9]. Therefore, owing to the limited number of cases, it is premature to evaluate the safety of the tentative standards of the 2017 guidelines based on the results of this study. Moreover, It is needless to say that obstetricians should take into account the risk factors for uterine rupture due to UFPMP; (1) grand multiparity, (2) induction of labor in a previously scarred uterus, (3) uterine malformation (anomalies) such as bicornuate uterus or septate uterus etc., (4) inappropriate oxytocin or prostaglandin usage, (5) vacuum extraction or forceps delivery, (6) too vigorous fundal pressure. Severe AEs such as intraocular bleeding (1), clavicle fracture (1), and severe neonatal asphyxia (2) (Apgar score <7 at 5 min) occurred in newborns. The primary causes of these AEs determined in the subsequent examinations are as follows: intraocular bleeding because of injury caused by the suction cup; clavicle fracture caused by shoulder dystocia; and relatively long time from the diagnosis of NRFS to delivery was responsible for the 2 cases of severe neonatal asphyxia (50 min and 33 min). Based on these findings, we can conclude that no AEs occurred directly by UFPMP.

This study has some limitations. First, this study was retrospective and conducted at a single tertiary perinatal medical center. In this study, we could evaluate the indications of UFPMP and the unity of its practice standards; however, it was impossible to avoid possible bias by each operator and neglect the presence of various confounding factors that may have been involved in AEs. Moreover, because the number of cases was limited in this study, it was also impossible to evaluate the safety of severe, yet rare AEs such as uterine rupture. In the current study, AEs that occurred in newborns have already subsided without sequela, which can be credited to the easy access to neonatologists and NICU at all times. Therefore, the results of this study cannot be generalized to other obstetric clinics. Second, we evaluated the conformity and safety aspects of UFPMP using data obtained before the introduction of the 2017 guidelines [7]. If possible, we should have used the standards defined before this study. Third, data from the study patients were missing. Particularly, the data of the records of the station of the fetal head at the time of UFPMP were missing for 71 patients (27%). This could be probably because these data were not objective that could be evaluated by staff members like other indexes (i.e., indications and the number of trials). Because obstetricians or

midwives who perform delivery assess the station of the fetus independently during a pelvic examination, no one can provide this information if post-delivery records are missing.

In conclusion, UFPMP performed during the second stage of labor were generally in line with the indications/implementation status of the 2017 guidelines [7], and no severe maternal AEs were observed. Also, no neonatal AEs that may have been caused directly by UFPMP were recorded. This study may support the validity of the 2017 guidelines [7]. Because it is difficult to find evidence of the safety of use of UFPMP, it is essential to accumulate experiences and results learned in clinical practice to build a consensus in the future using the current 2017 guidelines [7] as a standard as done in the current study.

Conflicts of interest

The authors declare that they have no competing interests.

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