

Manual Uterine Fundal Pressure in the Spontaneous Delivery during the Second Stage of Labor: A Pilot Case-Control Study Following an Analysis of Questionnaire Survey

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Abstract

Background: Recent obstetrical practice tends to avoid the use of manual uterine fundal pressure (MUFP); however, data showed that MUFP is actually employed. We here attempted 1) to determine the obstetricians' attitudes towards MUFP via questionnaire, and 2) to examine whether MUFP shortens the 2nd stage of labor, with the latter tested as a pilot study. **Methods:** A questionnaire-based study was carried out (n = 122) at meetings of Obstetrics on May 5, 2017. Then, we conducted a pilot case-control study from August 23 to September 6, 2020. Participants (n = 29) were divided into two groups; women who did and did not want MUFP; *i.e.*, MUFP (n = 14) vs. (Non-MUFP) group (n = 15). **Results:** Of 122 doctors, 99.18% (121/122) used MUFP at cesarean section. 95.90% (117/122) of institutions used MUFP in spontaneous delivery. 95.08% (116/122) obstetricians considered MUFP effective and helpful. 85.24% (104/122) considered that MUFP should be employed after station +3. In the case control study, MUFP vs. Non-MUFP group showed the second-stage-duration of 58.5 (50.25 - 71.25) vs. 48 (39 - 59) minutes, without statistical significance (P = 0.101). However, importantly, MUFP, compared with Non-MUFP group, showed a significantly shorter duration from head visible on introitus (apparition) to delivery; *i.e.*, 21.26 ± 7.32 vs. 30.13 ± 10.61 minutes (P = 0.014). **Conclusions:** MUFP is still used widely and MUFP shortened the duration of head apparition to delivery time. Larger-sample studies are needed to confirm the efficacy and safety of MUFP.

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Keywords

Manual Uterine Fundal Pressure, Labor, The Stage of Labor, Outcome, Instrumental Birth

1. Background

Management of the second stage of labor can have a potentially huge effect on maternal and neonatal outcomes. The manual uterine fundal pressure is prevalently performed to assist in expediting vaginal delivery during this stage of labor. Despite strongly held opinions against the use of this procedure and limited evidence regarding its maternal and neonatal benefits, many obstetricians are still in favor of it.

The rate of the using of manual uterine fundal pressure is difficult to get and the existing rates are suspect, because this procedure is frequently not documented in the medical record and the performer usually denies using it in delivery although it had been practiced, the full extent of its use is unknown. It was reported that MUFP was applied in 80% of institutions in the US [1] and in 89.4% of reporting institutions in Japan [2]. The rates in vaginal deliveries were ranging from 9.5% - 25% [3] [4], even up to 86% [5]. Though the 9.5% was down from 11.2% because of improvement of obstetric management [3]. In fact, MUFP was more prevalent in assisted vaginal deliveries than in spontaneous deliveries. The prevalence of MUFP was 12.1% in assisted vaginal deliveries [6].

Manual uterine fundal pressure is also used to assist birth at Caesarean section. It is a brief extra-abdominal maneuver applied by an obstetrician during a cesarean-section procedure to facilitate the passage of the baby through hysterotomy, whether cephalic and breech presentations. There are strong opinions for using it in the cesarean-section procedure and it is taken for granted, though there is still limited evidence regarding it.

Despite many observational studies and randomized controlled trials have found that MUFP shortened duration of the second stage of labor, there was insufficient evidence to draw conclusions on the beneficial or harmful effects of this procedure, regarding safety for the baby and for the routine use of it in the second stage of labor [1] [7] [8] [9] [10]. It was also associated with increased occurrence of uterine rupture, shoulder dystocia, fetal acidosis, cerebral palsy, episiotomies, maternal rib fracture [6] [11] [12] [13] [14], even hepatic and lienal rupture. The hepatic and lienal rupture was usually discussed in private and rarely reported, and the detail of them was unknown. A report about hepatic rupture due to MUFP was searched in Chinese database CNKI (China Knowledge Resource Integrated Database). But the manual uterine fundal pressure is still commonly and routinely applied especially there was evidence of prolonged second stage of labour or a need to expedite birth because of the fetal distress.

To understand why manual uterine fundal pressure is still practiced in delivery, especially at a vacuum or forceps delivery, even if we wanted to apply the MUFP in a spontaneous birth to replace the vacuum or forceps delivery, we conducted this questionnaire and pilot study to find out how this happened.

2. Methods

This study was divided into two parts including a questionnaire-based survey and a pilot case control study. In the first part, a questionnaire-based study was carried out at a meeting of Obstetrics on May 5, 2017. The questionnaire was written by the primary author and then improved and validated by the remaining authors to make sure the questions were easy to understand by respondents. We distributed the questionnaire to the attendees and the questionnaire was anonymous. A questionnaire regarding age, working lifetime, the level of hospital, the education level, the title of respondents, MUFP in cesarean delivery, MUFP in vaginal delivery, heard or treatment of the rupture of liver, spleen and uterus and the detailed of MUFP used in delivery.

In the second part, we conducted a pilot case control study over a period of 15 days from August 23 to September 6, 2020. There were only primiparas involved, all the multiparas were excluded. Singleton pregnancy between 37 and 42 weeks with the onset of head visible on vulval gapping was an inclusion criterion. The exclusion criteria were any complication or abnormality of women and fetus. The women were invited to comment on this study at the beginning of the second stage of labor. The woman who wanted MUFP to assist birth was allocated into MUFP group applied with MUFP when head visible on vulval gapping. The others who agreed to attend this study without using MUFP were allocated into Non-MUFP delivered spontaneously.

Manual uterine fundal pressure was applied manually by obstetricians or midwives when head visible on vulval gapping. The principle of the procedure was to apply firm and moderate manual pressure on the uterine fundus with two fists of hands or on the uterine fundus and both sides of the uterus with two palms of hands in the direction of the pelvis. Using two palm of hands was encouraged. MUFP must be applied in the duration of uterine contraction and the woman began holding her breath to bear down. MUFP continued until the woman began to breath. Once the woman did not hold her breath, the procedure must be stopped. The MUFP usually lasted 10s-20s, but not exceeding 30s. Forceful or rapid pressure was to be avoided.

Statistical analysis was performed with SPSS version 26. An analysis of the questionnaire data was presented as mean \pm standard deviation (SD) or % (number = n). The data of baseline characteristics of two groups were test by the Shapiro-Wilk test for normal distribution firstly. And the data were compared using t-test for the normal distributed data and the non-parametric test for the non-normal distributed data. The Chi-squared Test (χ^2 -test) and fisher's exact test was used for the count data. Odds ratios (OR) with 95% confidence interval

(CI) were conducted by an univariate logistic regression analysis. Differences with $P < 0.05$ were considered significant.

3. Results

In the questionnaire-based study, a total of 134 respondents were received and 122 (91.04%) respondents were assessed after excluding incomplete answers (Figure 1(a)). Table 1 presented the characteristics of the questionnaire.

The age of respondents was 40.79 ± 7.79 years (range from 25 to 60 years) and the working lifetime was 17.04 ± 9.18 years (range from 1 to 40 years). Of the 122 respondents, there were 121/122 (99.18%) applied MUFP routinely to assist birth at Caesarean section. Only 1 (0.82%) respondent did not apply UFP at Caesarean section. The prevalence rate of institutions using MUFP was 95.90% (117/122) in the spontaneous delivery.

Of the 117 respondents, 31/117 (25.41%) applied MUFP frequently to assist birth, and 86/117 (70.49%) applied occasionally. There was only 5/117 (0.41%) respondents never using MUFP to assist birth. There were 116 of 122 (95.08%) respondents thought that MUFP was effective and helpful to assist birth and 102 of 122 (83.61%) believed that using MUFP can decrease the assisted vaginal deliveries.

There were 104 of 122 (85.24%) respondents suggested that using MUFP should begin at station +3 (S+3). Only 4 (3.28%) respondents thought that the beginning of the use of MUFP should be from station +1 and 14 (11.48%) respondents from station +2. There were 26 of 122 (21.31%) respondents had treated or heard of rupture of liver, spleen and uterus in his own hospital.

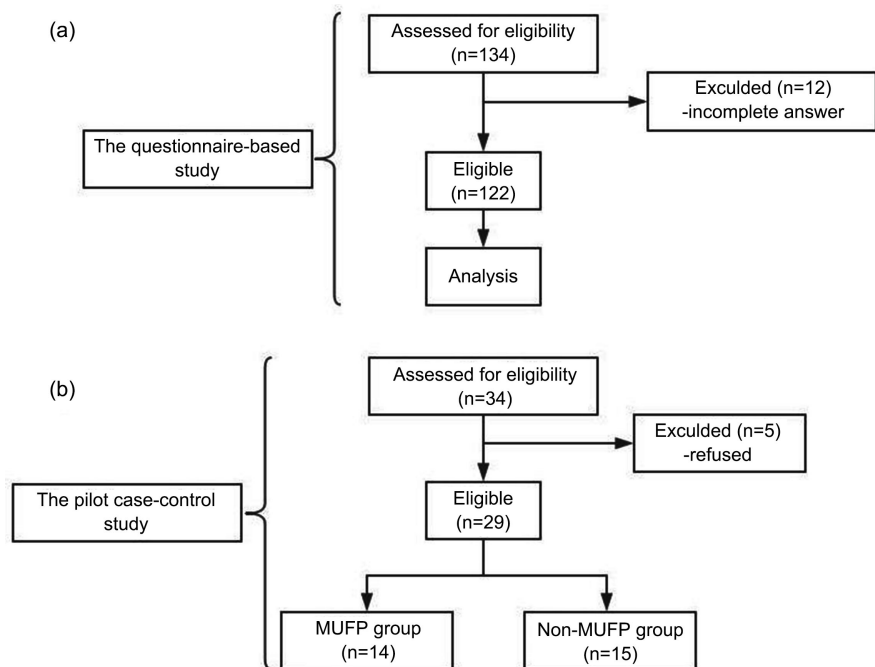


Figure 1. The flow chart of this study.

Table 1. Characteristics of the questionnaire.

Subjects	
Age (years)	40.79 ± 7.79 (25 - 60)
Working lifetime (years)	17.04 ± 9.18 (1 - 40)
Hospital levels	
Tertiary hospital (n)	59 (48.36%)
Secondary hospital (n)	63 (51.64%)
Education levels	
Bachelor degree (n)	84 (68.85%)
Master degree (n)	33 (27.05%)
Doctoral degree (n)	5 (0.41%)
Title of respondents	
Primary (n)	20 (16.39%)
Secondary (n)	61 (50.00%)
Senior (n)	41 (33.61%)
The use of MUFP in Cesarean Delivery	
With MUFP (n)	121 (99.18%)
Without MUFP (n)	1 (0.82%)
Characteristics of spontaneous vaginal delivery	
The use of UFP in spontaneous vaginal delivery	
Frequently (n)	31 (25.41%)
Occasionally (n)	86 (70.49%)
Never (n)	5 (4.10%)
Heard or treatment of rupture of liver, spleen and uterus	
Yes (n)	26 (21.31%)
No (n)	96 (78.69%)
If MUFP is effective and helpful	
Yes (n)	116 (95.08%)
No (n)	6 (4.92%)
If MUFP can decrease the assisted vaginal deliveries	
Yes (n)	102 (83.61%)
No (n)	20 (16.39%)
The most appropriate time of MUFP in the second stage	
Station +1 (S+1) (n)	4 (3.28%)
Station +2 (S+2) (n)	14 (11.48%)
Station +3 (S+3) (n)	104 (85.24%)

In the pilot case-control study, there were only 29 primiparas involved (**Figure 1(b)**). They were divided into 2 unequal groups: MUFP group (n = 14) and Non-MUFP group (n = 15). Maternal measures including age, gestational age, epidural analgesia and the duration of the first stage ($P > 0.05$). The incidence rate of perineal tears and cervical laceration did not increase in MUFP group ($P = 0.224$). The blood loss in MUFP group was similar to in Non-MUFP group ($P = 0.775$). The incidence rate of postpartum urinary retention did no

increased in MUFP group ($P = 0.999$).

There was no difference in birth weight between two groups ($P = 0.155$) and there was no lower Apgar score (Apgar score < 7 at 1 min) in the two groups. The duration of the second stage of the women in MUFP group was 58.5 (50.25 - 71.25) minutes compared to 48 (39 - 59) minutes in Non-MUFP group ($P = 0.101$) (**Table 2**). The duration from head visible on vulval gapping to head delivery of the women in MUFP group was 21.26 ± 7.32 minutes compared to 30.13 ± 10.61 minutes in Non-MUFP group ($P = 0.014$) (**Table 2, Figure 2**).

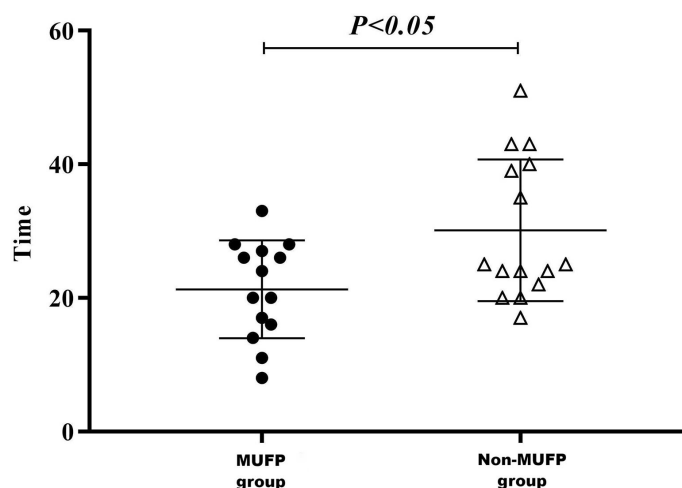


Figure 2. Shows significantly difference in the 2 groups. Using MUFP significantly shortens the duration from head visible on vulval gapping to head delivery.

Table 2. Characteristics in deliveries with and without MUFP.

Subjects	MUFP group (n = 14)	Non-MUFP group (n = 15)	Z/T/ χ^2	OR (95% CI)	P-value
Age (years)	29 (25 - 30)	29 (27 - 30)	-0.221	1.024 (0.809 - 1.296)	0.825
Gestational age (weeks)	40.22 (39.93 - 40.61)	40 (38.86 - 40.43)	-1.402	0.376 (0.106 - 1.334)	0.161
Gravidity (n)	1 (1 - 1.25)	1 (1 - 2)	-0.865	2.118 (0.549 - 8.18)	0.387
Epidural analgesia (n)	11 (78.6%)	11 (73.3%)	-	0.75 (0.135 - 4.165)	1
Duration of the first stage (mins)	290 (190 - 498.75)	320 (225 - 535)	-0.677	1.001 (0.996 - 1.005)	0.498
Duration of the second stage (mins)	58.5 (50.25 - 71.25)	48 (39 - 59)	-1.638	0.965 (0.919 - 1.013)	0.101
Duration from head visible on vulval gapping (mins)	21.26 ± 7.32	30.13 ± 10.61	-2.628	1.126 (1.009 - 1.256)	0.014
Perineal tears					
First-degree lacerations (n)	12 (85.7%)	15 (100%)	-	-	0.224
Episiotomy (n)	2 (14.3%)	0 (0%)	-	-	-
Cervical laceration (cervical tears)	0	0	-	-	-
Blood loss (ml)	280 (250 - 305)	280 (230 - 300)	-0.286	0.999 (0.986 - 1.011)	0.775
Postpartum urinary retention (n)	1 (7.1%)	1 (6.7%)	-	0.929 (0.053 - 16.423)	0.999
Birthweight (g)	3354.29 ± 366.14	3182.67 ± 260.53	1.462	0.998 (0.996 - 1.001)	0.155
Apgar score < 7 at 1 min	0	0	-	-	-

4. Discussion

In the questionnaire-based study, the analysis revealed that the accurate assessment was representative and valuable according to the questionnaire data of the age, working lifetime, hospital levels, education levels and the title of respondents.

According to the questionnaire study, we found that there were 99.18% respondents applied MUFP routinely to assist birth at Caesarean section. At Caesarean section, especially in women without labor, the fetal head may be unmolded, without a leading cephalic point and at a high position. The head usually is very difficult to lift through the uterine incision, once the head enters the incision, delivery may be aided by modest transabdominal fundal pressure. Even stronger MUFP may be used to aid the delivery in some situation. The “birth” is usually assisted by pressure exerted on the uterine fundus. The right hand of the surgeon or assistant is used to “press the baby out” of the uterus by pressing on the uterine fundus [15]. Many obstetricians take it for granted that they apply MUFP at Caesarean section. Although applying fundal pressure to facilitate Caesarean delivery produced significant haemodynamic effects, the impact of these effects may be clinically insignificant [16].

We also found that although nearly 21.31% respondents had treated or heard of rupture of liver, spleen and uterus due to MUFP, 95.08% respondents still thought that it was effective and helpful in the second stage. Even 83.61% respondents believed that MUFP can decrease the assisted vaginal deliveries and 95.90% respondents had applied the procedure to assist birth. There are some reasons for this situation. Though allowance of up to 3 - 4 h for the second stage of labor is recommended [17] [18] [19], prolonged duration of second stage of labor is associated with increased relative risks of adverse neonatal outcomes and an increased risk of low 5 min Apgar score [20] [21]. Even it was reported that prolongation of the second stage beyond historical precepts was unsafe and incorrect due to compromised safety of both the mother and the infant and currently available evidence fails to support the Obstetric Care Consensus position that longer second-stage labor is safe for the unborn infant [22] [23]. The meanwhile, it was reported that greater recovery from colorectal and anal dysfunction symptoms was associated with a shorter duration of the second stage of labor [24]. Birth is still expected to take place within 2 h of the start of the active phase of the second stage of labor by many obstetricians.

In order to avoid or shorten the prolonged duration of second stage of labor, obstetricians need to use instruments (a vacuum device or forceps) or other procedures to aid delivery. The indication for a vacuum device or forceps use is stated. If there were no stated indication for using instruments and obstetricians thought it needed to aid delivery, or the obstetricians feared the following maternal and perinatal morbidity and failure of using the vacuum device or forceps, they were forced to find other procedure to replace using a vacuum device or forceps and obstetricians preferred to choose the MUFP to replace them. Then

the MUFP was chosen to aid delivery, though there may be some complications. In fact, even though the vacuum device was used, the MUFP still used in the operative vaginal because of the failure of the use of a vacuum device. In the contrast, the procedure was rarely used in the operative vaginal of forceps because of the powerful traction. So, the MUFP is still, commonly and routinely used. The main data of our questionnaire revealed the persistent use of manual uterine fundal pressure in the second stage of labor for the obstetricians.

Through the questionnaire-based study, we also found that there were 85.24% (104/122) respondents suggested that using MUFP should begin at station +3 (S+3). According to this result, we clearly defined the using time of MUFP when head visible on vulval gapping in our following pilot study. There were also some other reasons. First, the second stage begins with complete cervical dilatation and the duration of the second stage is highly variable. Allowance of up to 3 - 4 h for the second stage of labor is recommended [17] [18] [19]. If the MUFP is applied from the beginning of the second stage, it is too long time for provider and women even though the procedure may shorten the second stage of labor. Secondly, quickly and further descent at the beginning of second stage may lead to early or late deceleration, even seriously prolonged deceleration. Thirdly, operative vaginal delivery should generally be performed from either a low or outlet station. When the fetal head is visible on vulval gapping, leading point of fetal skull is at station $\geq +2$ cm (a low or outlet station). And then, we can use the low or outlet vacuum device or forceps to aid delivery when assisted delivery is urgently needed.

The findings of the questionnaire-based study implied that the purpose of using this procedure was to shorten the during second stage of labor and reduce rate of the instrumental birth. And most obstetricians did not want to apply the procedure during the whole second stage, they just wanted to use MUFP when this procedure was technically feasible and the vaginal deliveries can be accomplished in any condition.

In the pilot case-control study, we found that the MUFP did not significantly shorten the duration of the second stage, on the contrary, the duration of the second stage with MUFP (58.5 minutes) increased nearly 10 minutes compared to without MUFP (48 minutes), though this difference was not statistically significant ($P = 0.101$). But there was a statistically significant difference between 2 groups after using the MUFP. The duration from head visible on vulval gapping to head delivery with MUFP reduced nearly 10 minutes compared to without MUFP (21.26 ± 7.32 vs. 30.13 ± 10.61 , $P = 0.014$). The MUFP significantly shortens the duration from head visible on vulval gapping (**Figure 2**). MUFP does assist delivery and reduce the duration from the beginning of using MUFP. It maybe reduces the time of the second stage if we applied the MUFP from the beginning of the second stage instead of using MUFP from head visible on vulval gapping.

The findings of the pilot case-control study implied that MUFP was useless to shorted the length of the second stage and it may be applied to reduce the need

for instrumental birth or assist the instrumental birth.

There were some strengths of our study. First, the study was designed as a pilot control study following an analysis of questionnaire survey with intention-to-clinical application analysis. Second, there were no similar studies in literature on this subject. Thirdly, we clearly defined beginning of using MUFP. Forth, we conducted an anonymous survey to collect data, allowing for accurate assessment. Some respondents may reduce the rate of the clinical use of MUFP or gave the wrong answers in the questionnaire on purpose because of fearing legal problems. In order to avoid this situation, we told respondents that the questionnaire was completely anonymous and we believed that the quality of the obtained answers was sufficient and actual. However, there were some limitations of the questionnaire survey and the pilot study. A limitation of this questionnaire was the small number of respondents which might have been skewed. The limitation of the pilot case-control study was its small number of recruited women. Though there was no adverse outcome, it was difficult to prove if the MUFP was the cause for the adverse outcome in a large trial. Our studies were underpowered to detect small, potentially clinical important differences.

5. Conclusion

We have found that manual uterine fundal pressure is still widely used. But most of obstetricians did not want to apply the procedure during the whole second stage. The main purpose of using it was just to shorten the duration of second stage of labor and reduce the rate of instrumental birth. Our small pilot study showed that manual uterine fundal pressure was useless to short the length of the second stage, it can reduce the duration from head visible on vulval gapping to head delivery. And the finding implied that it may be applied to reduce the need for instrumental birth or assist the instrumental birth. But our study was too small to evaluate the safety of maternal and infant outcomes. The future research should be focused on whether the using of the procedure can shorten the length of the second stage and reduce the need for instrumental birth or assist the instrumental birth in order to persuade obstetricians to use it or not to use it in the second stage of labor. In our opinion, manual uterine fundal pressure should not be encouraged to routinely use in the second stage, but it may be used during the head delivery.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of Shandong Province Maternal and Child Health Care Hospital (SFYLL2020020). We confirmed that all methods were carried out in accordance with relevant guidelines and regulations and informed consent was obtained from all subjects.

Availability of Data and Materials

The datasets used and/or analysed during the current study will be available

from the corresponding author on reasonable request.

Authors' Contributions

Shili Su, Zhaowen Chen: designed and conducted the study, writing original draft, preparation and editing. Jinping Liu and Jing Wang: applying MUFPP, assist delivery as midwife, data curation. Linlin Wang: data curation and coding.

Trial Registration

This study was registered at <http://www.chictr.org.cn/index.aspx> (registration number: ChiCTR2000041411, 25/12/2020).

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Verheijen, E.C., Raven, J.H. and Hofmeyr, G.J. (2009) Fundal Pressure during the Second Stage of Labour. *Cochrane Database of Systematic Reviews*, No. 4, CD006067. <https://doi.org/10.1002/14651858.CD006067.pub2>
- [2] Hasegawa, J., Sekizawa, A., Ishiwata, I., Ikeda, T. and Kinoshita, K. (2015) Uterine Rupture after the Uterine Fundal Pressure Maneuver. *Journal of Perinatal Medicine*, **43**, 785-788. <https://doi.org/10.1515/jpm-2014-0284>
- [3] Hasegawa, J., Sekizawa, A., Arakaki, T., *et al.* (2020) Decline Number of Uterine Fundal Pressure Maneuver in Japan Recent 5 Years. *Journal of Obstetrics and Gynaecology Research*, **46**, 413-417. <https://doi.org/10.1111/jog.14203>
- [4] Rubashkin, N., Torres, C., Escuriet, R. and Dolores Ruiz-Berdún, M. (2019) "Just a Little Help": A Qualitative Inquiry into the Persistent Use of Uterine Fundal Pressure in the Second Stage of Labor in Spain. *Birth*, **46**, 517-522. <https://doi.org/10.1111/birt.12424>
- [5] Buhimschi, C.S., Buhimschi, I.A., Malinow, A.M., Kopelman, J.N. and Weiner, C.P. (2002) The Effect of Fundal Pressure Manoeuvre on Intrauterine Pressure in the Second Stage of Labour. *BJOG*, **109**, 520-526. <https://doi.org/10.1111/j.1471-0528.2002.01399.x>
- [6] Furrer, R., Schäffer, L., Kimmich, N., Zimmermann, R. and Haslinger, C. (2016) Maternal and Fetal Outcomes after Uterine Fundal Pressure in Spontaneous and Assisted Vaginal Deliveries. *Journal of Perinatal Medicine*, **44**, 767-772. <https://doi.org/10.1515/jpm-2015-0101>
- [7] Hofmeyr, G.J., Vogel, J.P., Singata, M., Habib, N.A., Landoulsi, S. and Gülmezoglu, A.M. (2018) Does Gentle Assisted Pushing or Giving Birth in the Upright Position Reduce the Duration of the Second Stage of Labour? A Three-Arm, Open-Label, Randomised Controlled Trial in South Africa. *BMJ Global Health*, **3**, e000906. <https://doi.org/10.1136/bmjgh-2018-000906>

- [8] Suzuki, S. (2015) Selective Uterine Fundal Pressure Maneuver during the Second Stage of the First Twin Delivery at near Term. *The Journal of Maternal-Fetal & Neonatal Medicine*, **28**, 519-521. <https://doi.org/10.3109/14767058.2014.921901>
- [9] Moiety, F.M. and Azzam, A.Z. (2014) Fundal Pressure during the Second Stage of Labor in a Tertiary Obstetric Center: A Prospective Analysis. *Journal of Obstetrics and Gynaecology Research*, **40**, 946-953. <https://doi.org/10.1111/jog.12284>
- [10] Api, O., Balcin, M.E., Ugurel, V., Api, M., Turan, C. and Unal, O. (2009) The Effect of Uterine Fundal Pressure on the Duration of the Second Stage of Labor: A Randomized Controlled Trial. *Acta Obstetrica et Gynecologica Scandinavica*, **88**, 320-324. <https://doi.org/10.1080/00016340902730326>
- [11] Hasegawa, J., Ikeda, T., Toyokawa, S., Jojima, E., Satoh, S., Ichizuka, K., et al. (2021) Obstetric Factors Associated with Uterine Rupture in Mothers Who Deliver Infants with Cerebral Palsy. *The Journal of Maternal-Fetal & Neonatal Medicine*, **34**, 663-669. <https://doi.org/10.1080/14767058.2019.1611775>
- [12] Sturzenegger, K., Schäffer, L., Zimmermann, R. and Haslinger, C. (2017) Risk Factors of Uterine Rupture with a Special Interest to Uterine Fundal Pressure. *Journal of Perinatal Medicine*, **45**, 309-313. <https://doi.org/10.1515/jpm-2016-0023>
- [13] Sartore, A., De Seta, F., Maso, G., et al. (2012) The Effects of Uterine Fundal Pressure (Kristeller Maneuver) on Pelvic Floor Function after Vaginal Delivery. *Archives of Gynecology and Obstetrics*, **286**, 1135-1139. <https://doi.org/10.1007/s00404-012-2444-x>
- [14] Matsubara, S., Mita, F., Kikkawa, I. and Suzuki, M. (2012) Maternal Rib Fracture after Manual Uterine Fundal Pressure. *Rural Remote Health*, **12**, 2062. <https://doi.org/10.22605/RRH2062>
- [15] Vejnović, T.R., Costa, S.D. and Ignatov, A. (2012) New Technique for Caesarean Section. *Geburtshilfe und Frauenheilkunde*, **72**, 840-845. <https://doi.org/10.1055/s-0032-1315347>
- [16] Kim, T.Y. and Ryu, D.H. (2006) The Effect of Fundal Pressure at Caesarean Section on Maternal Haemodynamics. *Anaesthesia*, **61**, 434-438. <https://doi.org/10.1111/j.1365-2044.2006.04612.x>
- [17] WHO (2018) Recommendations: Intrapartum Care for a Positive Childbirth Experience. World Health Organization, Geneva.
- [18] (2017) Intrapartum Care for Healthy Women and Babies. National Institute for Health and Care Excellence (UK), London.
- [19] (2019) ACOG Committee Opinion No. 766 Summary: Approaches to Limit Intervention during Labor and Birth. *Obstetrics & Gynecology*, **133**, 406-408. <https://doi.org/10.1097/AOG.0000000000003081>
- [20] Sandström, A., Altman, M., Cnattingius, S., et al. (2017) Durations of Second Stage of Labor and Pushing, and Adverse Neonatal Outcomes: A Population-Based Cohort Study. *Journal of Perinatology*, **37**, 236-242. <https://doi.org/10.1038/jp.2016.214>
- [21] Altman, M., Sandström, A., Petersson, G., et al. (2015) Prolonged Second Stage of Labor Is Associated with Low Apgar Score. *European Journal of Epidemiology*, **30**, 1209-1215. <https://doi.org/10.1007/s10654-015-0043-4>
- [22] Nelson, D.B., McIntire, D.D., Leveno, K.J. (2020) Second-Stage Labor: Consensus versus Science. *American Journal of Obstetrics & Gynecology*, **222**, 144-149. <https://doi.org/10.1016/j.ajog.2019.08.044>
- [23] Leveno, K.J., Nelson, D.B. and McIntire, D.D. (2016) Second-Stage Labor: How

Long Is Too Long? *American Journal of Obstetrics & Gynecology*, **214**, 484-489.

<https://doi.org/10.1016/j.ajog.2015.10.926>

- [24] Pardo, E., Rotem, R., Gliner, H., *et al.* (2019) Recovery from Pelvic Floor Dysfunction Symptoms in the Postpartum Is Associated with the Duration of the Second Stage of Labor. *Archives of Gynecology and Obstetrics*, **300**, 127-133.
<https://doi.org/10.1007/s00404-019-05173-1>

Abbreviations

MUFP: manual uterine fundal pressure;

Non-MUFP: without manual uterine fundal pressure;

CNKI: China Knowledge Resource Integrated Database;

SD: mean \pm standard deviation; n: number;

OR: odds ratios;

CI: confidence interval.