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Research Article

Repetition of Prolonged Labor and Vacuum Extraction: A Retrospective Observational Study at a Single Private Clinic

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Abstract

Aim: There are a few reports on the subsequent labor following a long and difficult labor. Therefore, this study aimed to investigate the frequencies of repeated prolonged labor and vacuum extraction, and the change in the labor duration within the same woman.

Materials and Methods: Data of women who vaginally delivered their first and second babies between 2004 and 2016 were retrospectively examined (n=860). The inclusion criteria were as follows: gestation of at least 37 weeks, cephalic presentation, and singleton pregnancy.

Results: A prolonged first stage (>20 h for nulliparas and >14 h for multiparas) was observed in 139 nulliparas, with nine women (6.5%) experiencing a repeated prolonged first stage. A prolonged second stage (>3 h for nulliparas and >2 h for multiparas) was observed in 80 nulliparas, with one woman (1.3%) experiencing a repeated prolonged second stage. From the first to the second childbirth, the mean first stage duration significantly decreased from 1,782 min to 422 min, and the second stage duration decreased from 355 min to 29 min in women with a prolonged first and second stage, respectively, in the first childbirth. Vacuum extraction was performed in 96 nulliparas, with 5 women (5.2%) undergoing vacuum extraction in the subsequent childbirth.

Conclusion: A long and difficult labor may reoccur, but not frequently, and the duration of the second labor is decreased greatly. This may encourage women who are anxious about their next pregnancy and childbirth after having experienced a long and difficult first labor.

Keywords: Repetition; Prolonged labor; Vacuum extraction; Dystocia

Abbreviations

SoL: Stage of Labor

Introduction

The second childbirth is generally easier and more rapid than the first childbirth, and nulliparity is regarded as a dystocia-related factor [1,2]. A long and difficult childbirth may cause posttraumatic stress disorder [3,4], and women who experience a long and difficult labor frequently agree with the statement 'my birth experience made me decide not to have any more children' [5]. Furthermore, women with a history of dystocia tend to seek information regarding whether a similar difficult and long labor is likely in subsequent childbirths.

Several reports on repeat dystocia and vacuum extraction exist. Sandström et al. [6] reported that overall labor dystocia affected 12% of women with previous dystocia in a Swedish population-based cohort. In addition, Elvander and Cnattingius [7] reported the rate of repeat vacuum extraction to be 6%. However, there are few reports comparing the duration of labor between first and second childbirths within the same woman, especially according to whether the first labor was prolonged. Therefore, the aim of the present study was to investigate the frequencies of repeated long and difficult labor and vacuum extraction, and to compare the durations of the first and second labors within the same woman, focusing on the duration of the second labor following a prolonged first labor.

Materials and Methods

Data of women who vaginally delivered their first and second babies between January 2004 and December 2016 at a private obstetrics and gynecology clinic located in Shizuoka City were retrospectively investigated. The enrollment criteria were as follows: gestation of at least 37 weeks, cephalic presentation, and singleton pregnancy. Patients who experienced breech presentation, cesarean delivery, or fetal demise before the onset of labor were excluded. The clinic mainly accepted low-risk pregnancies/deliveries, and pregnant women with severe medical diseases (such as maternal heart, thyroid, and mental diseases) or severe pregnancy-induced hypertension were referred to tertiary hospitals. This study was approved by the local ethics committee (No. 17002), which waived the requirement of obtaining informed consent from the patients.

The first stage of labor (1st SoL) was considered prolonged when it lasted longer than 20 h for nulliparous women and longer than 14 h for multiparous women [8]. The second stage of labor (2nd SoL) was considered prolonged when it lasted longer than 3 h for nulliparous

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Table 1: Baseline characteristics of the 860 women enrolled in this study.

	Unit	1st labor		2nd labor		p-Value
		Mean	SD	Mean	SD	
Maternal age	years	28.9	3.9	31.8	4.0	<0.001
Gestational age	days	278	7	275	6	<0.001
Height	cm	158.2	5.1	158.2	5.1	0.025
Weight	kg	50.3	6.6	51.2	7.0	<0.001
Body mass index	kg/m^2	20.1	2.3	20.5	2.5	<0.001
Weight gain	kg	10.8	3.4	10.5	3.0	0.006
Neonatal weight	g	3016	333	3098	346	<0.001
Duration of 1st stage of labor	min	749	569	317	227	<0.001
Prolonged 1st stage of labor	n	139	16.2%	23	2.7%	<0.001
Duration of 2nd stage of labor	min	90	122	21	24	<0.001
Prolonged 2nd stage of labor	n	80	9.3%	8	0.9%	<0.001
Vacuum extraction	n	96	11.2%	9	1.0%	<0.001

Comparing 1st labor and 2nd labor (paired t-test or Fisher's exact test).

Table 2: Number of prolonged labor in the 1st stage (A) and 2nd stage (B) of labor.

A. 1st stage of labor		2nd labor		
		Prolonged	Normal	Total
1st labor	Prolonged	9	130	139
	Normal	14	707	721
	Total	23	837	860

OR 3.49(95% CI: 1.30-8.85), p=0.002.

B. 2nd stage of labor		2nd labor		
		Prolonged	Normal	Total
1st labor	Prolonged	1	79	80
	Normal	7	773	780
	Total	8	852	860

OR 1.39(95% CI: 0.03-11.1), p=0.75.
OR: Odds Ratio; CI: Confidence Interval.

women and longer than 2 h for multiparous women; however, if epidural analgesia was used, the criteria for a prolonged 2nd SoL was adjusted by 1 h (4 h for nulliparous women; 3 h for multiparous women) [9]. Vacuum extraction was used when appropriate, but forceps delivery was not performed at this clinic.

All statistical analyses were performed using Stata/MP version 14.2 software (Stata Corp., College Station, TX, USA). A P-value <0.05 was regarded as significant. Continuous variables were compared using unpaired and paired t-tests. In addition, Odds Ratios (ORs) and 95% confidence intervals (95% CIs) were determined for two-level categorical variables.

Results

A total of 891 women delivered their first baby vaginally with cephalic presentation at 37 weeks of gestation or longer and later delivered a second baby at the clinic within the study period. Of these, 31 women were excluded, because the second childbirth involved a home delivery (n=2), vaginal breech (n=2), preterm delivery (n=13), or cesarean section (n=14). The indication of cesarean section for the second birth was breech presentation (n=12), myomectomy after the first childbirth (n=1), or fetal distress due to abruption placentae (n=1). No cesarean sections were performed due to dystocia in the second childbirth. Finally, a total of 860 women were enrolled in this study (Table 1).

Prolonged 1st SoL

A prolonged 1st SoL was observed in 139 (16.2%) and 23 (2.7%) nulliparous and multiparous women, respectively (Table 1). Nine out of the 139 nulliparous women (6.5%) with a prolonged 1st SoL in the first childbirth had a repeated prolonged 1st SoL in the subsequent childbirth, whereas 14 out of 721 women (1.9%) without a prolonged 1st SoL in the first childbirth experienced a prolonged 1st SoL in the subsequent childbirth (OR 3.49, 95% CI 1.30-8.85, p=0.002; Table 2A). The mean duration of the 1st SoL for women with a prolonged first labor was 1,782 min (95% CI 1,688-1,876 min) and that for women without a prolonged first labor was 550 min (95% CI 529-571 min; Table 3A). Although the mean duration of the 1st SoL of the second labor was still longer in women with a prolonged 1st SoL in the first labor than in women without a prolonged 1st SoL in the first labor (422 min *vs.* 297 min, p<0.001, Table 3A), the reduction time (1st labor 1st SoL - 2nd labor 1st SoL) was significantly greater in the former than in the latter (1,360 min *vs.* 253 min, p<0.001; Table 3A).

Prolonged 2nd SoL

A prolonged 2nd SoL was observed in 80 (9.3%) and 8 (0.9%) nulliparous and multiparous women, respectively (Table 1). One out of the 80 nulliparous women (1.3%) with a prolonged 2nd SoL in the first childbirth had a repeated prolonged 2nd SoL in the subsequent labor, whereas 7 out of 780 women (0.9%) without a prolonged 2nd SoL in the first childbirth experienced a prolonged 2nd SoL in the subsequent childbirth (p=0.75, OR 1.39, 95% CI 0.03-11.1; Table 2B). The mean duration of the 2nd SoL for women with a prolonged first labor was 355 min (95% CI 297-412 min) and that for women without a prolonged first labor was 63 min (95% CI 60-66 min; Table 3B). Although the mean duration of the 2nd SoL in the second labor was still longer in women with a prolonged 2nd SoL in the first labor than in women without a prolonged 2nd SoL in the first labor (29 min *vs.* 20 min, p<0.001), the reduction time (1st labor 2nd SoL - 2nd labor 2nd SoL) was greater in the former than in the latter (325 min *vs.* 43 min, p<0.001; Table 3B).

Vacuum extraction

Vacuum extraction was performed in 96 (11.2%) and 9 (1.0%) nulliparous and multiparous women, respectively (Table 1). Five out of the 96 nulliparous (5.2%) women who underwent vacuum extraction in the first childbirth underwent vacuum extraction in the subsequent childbirth, whereas 4 out of 764 women (0.5%) who spontaneously delivered their first baby delivered their second baby by vacuum extraction. The relative risk for vacuum extraction during the second labor was significantly higher if the first delivery was by vacuum extraction (p<0.001, OR 10.4, 95% CI 3.5-30.8; Table 4).

Discussion

The present study found relatively low rates of recurrent prolonged labor and greatly decreased labor duration in the subsequent childbirth following a prolonged first labor. However, the risk of a prolonged childbirth and vacuum extraction was higher in

Table 3: Duration (min) of 1st stage (A) and 2nd stage (B) of labor.

A. 1st stage	1st labor		2nd labor		Difference (1st-2nd)		P-value*1
	Mean	95% CI	Mean	95% CI	Mean	95% CI	
1st labor		Lower - Upper		Lower - Upper		Lower - Upper	
Prolonged n=139	1782	1688 - 1876	422	377 - 468	1360	1257 - 1463	<0.001
Normal n=721	550	529 - 571	297	281 - 312	253	231 - 276	<0.001
Difference	1232	1170 -1295	126	85-166	1107	1039-1175	
(prolonged-normal)							
P-value*2	0.003		<0.001		<0.001		

B. 2nd stage	1st labor		2nd labor		Difference (1st-2nd)		P-value*1
	Mean	95% CI	Mean	95% CI	Mean	95% CI	
1st labor		Lower - Upper		Lower - Upper		Lower - Upper	
Prolonged n=80	355	297-412	29	23-36	325	270-381	<0.001
Normal n=780	63	60-66	20	18-21	43	40-46	<0.001
Difference	292	271-312	9	4-15	282	262-302	
(prolonged-normal)							
P-value*2	<0.001		<0.001		<0.001		

Data are expressed as mean (95% confidence interval),
*1 Comparing duration of 1st labor and 2nd labor (paired t-test),
*2 Comparing duration of normal labor and prolonged labor (unpaired t-test),
OR: Odds Ratio; CI: Confidence Interval.

women who experienced a prolonged 1st SoL or vacuum extraction in their first childbirth than in women without these experiences.

Clinical factors associated with dystocia include small stature, obesity, advanced maternal age, large fetus, nulliparity [2,10], and anxiety [11]. To determine whether a given labor is prolonged, the normal duration of labor must be defined; however, this remains a controversial and challenging issue [12]. Any cut-off value for the length of a normal labor is based on an arbitrary decision [13]. The normal 'labor curve' first reported by Friedman [14,15] 60 years ago has been used as a gold standard in obstetrical practice. However, its validity has been recently challenged, as many changes have occurred in the assessment and care of women in labor [16]. Namely, pregnant women are currently more obese and older, and the induction/augmentation of labor and epidural use are more frequent, than in previous times [17,18]. Simkin and Ancheta [19] stated that identifying labor is one of the greatest challenges for pregnant women, their families, and their caregivers, with a surprisingly wide disagreement on when labor and active labor begin. In the present study, a 1st SoL longer than 20 h and 14 h for nulliparous and multiparous women, respectively, was considered prolonged [8]. In addition, a 2nd SoL longer than 3 h and 2 h for nulliparous and multiparous women, respectively, was considered prolonged. As in a previous study, 1 h was added to the cut-off values for a prolonged 2nd SoL in cases of epidural use [9]. This definition of the normal duration of the 2nd SoL is 1 h longer than that in the 2004 American College of Obstetricians and Gynecologists (ACOG) definition for both nulliparous and multiparous women [20].

Kjaergaad et al. [10] reported that the rate of dystocia was as high as 37% for nulliparous women. Furthermore, Sandström et al. [6] reported that the overall recurrence rate of dystocia in the second pregnancy was 12%, which was four-times higher than that in women without previous dystocia. In the present study, the rates of recurrence for a prolonged 1st SoL and 2nd SoL were 6.5% and 1.3%, respectively, which are lower than those in previous reports. This may be due to the use of less stringent criteria for dystocia [9]. Interestingly, the rate of a prolonged 1st SoL in the second childbirth was three-times higher in women with a previous prolonged 1st SoL compared to that in women without a previous prolonged 1st SoL (6.5% *vs*. 1.9%), whereas a prolonged 2nd SoL was observed at a similar rate in women with and without a previous prolonged 2nd SoL (1.3% *vs*. 0.9%). In addition, the duration of the second labor was decreased markedly from that of the first labor, irrespective of whether the first labor was prolonged, but the amount of the reduction was greater for women with a prolonged 1st and/or 2nd SoL than in women without a prolonged 1st and/or 2nd SoL.

Vacuum extraction is performed in cases of an exhausted mother, fetal distress, or long 2nd SoL [21]. Elvander and Cnattingius [7] reported the recurrence rate of vacuum extraction as 6.3% in a Swedish population-based registry, and the relative risk of vacuum extraction in the second childbirth was 4.75 (95% CI, 4.55-4.96) relative to that in women who vaginally delivered their first baby spontaneously. Moreover, Mawdsley and Baskett [22] reported vacuum extraction rates of 2.5%, and 3.0% for women who delivered their first baby spontaneously and those who underwent instrumental vaginal delivery, respectively. Bahl and Strachan [23] reported that 7.2% of women undergo recurrent instrumental vaginal delivery, whereas 3.0% of women whose first delivery was spontaneous undergo subsequent instrumental vaginal delivery. In the present study, the rate of recurrent vacuum extraction was 5.2%, approximately ten-times higher than that for women who delivered their first baby vaginally (0.5%). Thus, although the chance of repeat vacuum extraction is low, the risk of vacuum extraction is higher

Table 4: Number of vacuum extraction and spontaneous vaginal delivery.

	2nd labor			
1st labor		Vacuum	Spontaneous	Total
	Vacuum	5	91	96
	Spontaneous	4	760	764
	Total	9	851	860

OR: 10.4 (95% CI: 2.2-53.3), p<0.001,
OR: Odds Ratio; CI: Confidence Interval.

in women with a history of vacuum extraction compared to that in women who delivered their first baby spontaneously.

Some multiparous women undergo cesarean section due to dystocia despite previous vaginal delivery. For example, Çelik et al. [24] reported that 10 out of 238 multiparous women with a history of vaginal birth underwent a cesarean section due to obstructed labor. Furthermore, Desai et al. [25] found that cephalopelvic disproportion and prolonged labor were the third and sixth most common causes of cesarean section in multiparous women, respectively. Similarly, Himabindu et al. [26] reported that prolonged labor was the fifth most common cause of primary cesarean section in multiparous women. However, in the present study, no cesarean sections were performed due to dystocia in the second birth.

The present study has some limitations to acknowledge. First, the results are based on data from a single private clinic where only low-risk pregnancy/labor was accepted, suggesting a selection bias. Nulliparous women who considered themselves to have some dystocia-related factors (short stature, 35 years or older, obese, and so on.) may have chosen other clinics/hospitals. Multiparous women whose first labor was long and difficult may have visited other hospitals for their second childbirth. Second, forceps were not used for instrumental vaginal delivery. Forceps are considered to be quicker and have a lower failure rate than vacuum extraction for delivering a child during a difficult labor [27,28]. Therefore, the use of forceps may impact the results.

Additionally, the present study has several strengths. The diagnosis of dystocia or protracted labor varies among physicians and hospitals [5], as well as the cesarean rate [29,30]. If a cesarean section is performed too early, the number of prolonged labor and vacuum extraction cases will decrease. However, as the current data are based on a single private clinic, and the decision to perform vacuum extraction and cesarean section was made exclusively by the same physician, there was little room for variability in the diagnosis of dystocia/prolonged labor. Furthermore, many studies collectively report the duration of labor for nulliparous and multiparous women [8,12,16-18]. In contrast, in the present study, the duration of labor was separately described according to the presence or absence of a prolonged first labor. Thus, the results may help in advising women who experienced a prolonged first labor and are planning their next pregnancy. Finally, the present study was based on data from many pregnant women; thus, it is considered to have internal validity.

Conclusion

A long and difficult labor may reoccur, but not frequently, and the duration of the second labor is markedly shorter than that of the first labor. This may encourage women who are anxious about their next pregnancy and childbirth due to a long and difficult first labor.

Data Availability Statement

The data used to support the findings of this study are available from the corresponding author upon request.

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